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HUGH M. WILSON, 1st Vice-President. A. E. CLIFFORD, 2d Vice-President.
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TELEPHONE CALL: 4700 BRYANT. CABLE ADDRESS: ELECTRICAL, NEW YORK.

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A. S. M'ALLISTER.....Associate Editor
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DRIFT OF EXPORT TRADE.

The figures have just been issued of export trade during January, and show a slight gain over the corresponding month in 1909. The value of heavy electrical machinery exported was $565,838 as compared with $452,851; while the value of electrical instruments and apparatus was $621,469 as compared with $500,309. The total was $1,187,307 as against $953,160, an increase of $234,147—quite a noticeable gain.

The improvement seems to have been pretty generally distributed, offset by losses here and there; and in most instances the explanation might easily be the making, or the absence of, some special shipment during the month. Thus, in British North America, the heavy stuff required rose from $34,394 to $77,651, and apparatus from $98,441 to $174,781. These figures would certainly seem to intimate better trade conditions; and they are correspondingly matched by those from Mexico, which took a total of $179,084 as compared with $82,724. Our prosperity seems to go hand in hand with that of our neighbors to the south and north of us. Europe, outside of England, France and Germany, has lately had little need for us. Heavy electrical machinery fell off from $92,262 to $18,567, a rather startling drop; and in like manner sales of $12,962 in electrical apparatus were simply cut in two. It would probably be found that such markets if at all active were being supplied by our competitors, not necessarily with better goods, but at lower prices, or under better credit terms.

THE ARTISTIC IN ILLUMINATION.

We present in the current issue an account of some exceptionally beautiful lighting effects in one of the great restaurants of the metropolis. There is no need here to go into a review of the details of the work, which are fully shown in the article itself, but it is pertinent to point out that the dominating motive in the illumination in this case is to secure artistic results carrying out the general scheme of the architect in his decoration, and not merely to secure the necessary light for comfortable eating at the minimum expense. It was necessary in the beginning of the art of scientific lighting to lay stress on efficiency, which had long been signally neglected. In fact, if he knows his business at all, the illuminating engineer must know how to secure first-class illumination at the highest efficiency, but he must also know how best to produce the effects that may be desired when he is not rigidly confined to the most economical methods of work. It is right at this point that the illuminating engineer and the architect often quarrel, whereas, in fact, this is their very best point of contact. In the past the architect, as a rule, has neither known nor cared how to produce scientifically good lighting at the lowest or any other cost. His training, generally, has not been in the least as would ever help him to such knowledge. On the other hand, he has known definitely the lighting effects that he wished to produce, al-

though frequently going about the work in a very maladroit and unscientific manner. The illuminating engineer, on the other hand, has had drilled into him by hard necessity the importance of highly efficient lighting, and has sometimes erred by going too far in this direction. Naturally he and the architect quarrel at times, both being at fault, as commonly happens in quarrels between naturally peaceable persons.

In an example like that before us the fundamental motive of the lighting equipment has been to secure certain effects, extreme economy being altogether a secondary matter, just as it is in the larger architectural effects. The result has been a very skilful employment of the resources of modern illuminating engineering to obtain the results sought. Artists may or may not agree as to the merits of the result, which is undeniably striking and beautiful, but the whole installation is a type of the sort of thing which the trained illuminating engineer must be prepared to handle, not with hard and fast notions about efficiency, but with a cordial desire to meet the architect more than half way and to do the thing which is to be undertaken as well as the resources of the art permit. It is just the kind of task which the architect has perpetually set before him—on the one hand a demand for the most economical possible construction consistent with harmonious results, and on the other, for the most harmonious and beautiful results with but slight reference to the cost of obtaining them. The successful illuminating engineer of the future is likely to be less of a technician than to-day and more a man of artistic taste united with tact in dealing with his clientele.

Effect-lighting is a branch of illuminating engineering that stands somewhat by itself, but deserves greater attention than it usually receives. There are some masters of technique in this line among the electricians of the theaters who have to become familiar with all the possibilities of lighting effects as part of their daily work. The illuminating engineers used to other lines of work are too apt to lay over-much stress on the bald efficiency. There is no reason why all the modern efficient illuminants cannot be used, so to speak, to enrich the results to be obtained for a given cost, instead of devoting everything than can be gained by their use to a decrease of expense. Such installations as the one before us are well worth very critical study on the part of illuminating engineers, with the object of ascertaining, not how the lighting could have been done differently, but how the same effects could have been obtained, if at all, by even more efficient material than at present.

THE FLICKER PHOTOMETER.

The subject of heterochromic photometry is being forced upon the attention of engineers by the increasing use of illuminants differing widely from the old incandescent lamps in the matter of color. In recent discussions of the subject, the question has arisen whether the phenomenon of flicker gives a comparison between light sources, the correctness of which is substantially uninfluenced by the color differences which may exist between them. In other words, does the flicker photometer substantially dodge the difficulties of color comparison? This question must be answered as a preliminary to settling anything like a standard method of color photometry. Granting that the flicker photometer enables comparisons between colored lights to be made with substantially the same precision as if the lights were of the same color, there arises the further question as to whether the two lights when compared by the phenomenon of flicker are correctly compared in the sense, that when equal by flicker they will also illuminate a given surface with the same brightness when equidistant from it. In other words, does flicker correctly measure the useful intensity of the lights compared by it even granting that they can be more consistently compared by flicker than by direct comparison of brightness?

Experiments recently cited in these pages by Mr. J. S. Dow indicate that for moderate differences of color the flicker photometer and the ordinary screens that permit the comparison of equality of brightness give approximately the same result, while with widely different colors the comparison is less accurate. There seems also to be a good deal of consistent evidence to the effect that the flicker instrument is less affected by extreme variations in the brightness of the illumination on the screen than is the usual photometer. Undoubtedly the sensation of flicker does vary much less with color than does the ordinary estimate of brightness. Whether a comparison by means of the phenomenon of flicker gives a correct measure of the useful illumination is another matter. The mere fact that the equality-of-brightness method and the flicker methods do not give the same results for lights differing considerably in color is proof conclusive that they are at least not measuring the same function of the luminous energy. From a practical standpoint light is provided for the purpose of seeing things, and two lights are equal when they give equal facility of discrimination for the work in hand. So far as the lights of nearly the same color are concerned, it seems to be well established by experiment that the apparent equality of brightness is a perfectly safe criterion—that equal facility of reading, for example, gives a safe criterion and that the flicker method substantially agrees with both of these. When, however, the lights to be compared are of very different colors, there is no evidence yet available that either the flicker instrument or the ordinary equality-of-brightness instrument gives a correct measure of the illuminating value of the light for the purposes of its use. The selenium photometer gives still another criterion for the comparison of lights of different colors, but is not likely, so far as any experiments now at hand indicate, to give a better result than either of the others.

The underlying difficulty is, of course, that seeing is not a physical but physiological phenomenon, so that in any measurement of the useful effect of light for seeing, physiological factors have to be considered. The nature of the work to be done determines in great measure the usefulness of the illumination if its color varies considerably from white. Black letters on white paper are likely to give a different set of estimates regarding the usefulness of illumination from those that would be obtained if one used tinted paper or inks. It would make a difference, too, whether the test were one of acuity or of delicate shade perceptions of objects sufficiently large to eliminate differences of acuity. In settling the usefulness of the flicker photometer as a practical instrument, it is necessary first, to find out whether it is good as an instrument compared with the ordinary forms of photometer—that is, whether it actually compares the lights presented to it in a convenient and consistent way. If it does this, then does it

compare the property of illumination desired or does it compare some other property less pertinent to the case? The one comforting feature of the investigation of Mr. Dow above referred to is that it seems already pretty well settled that all the forms of photometer agree reasonably well in their results when used on lights that are anywhere nearly white. Inasmuch as lights that are fairly nearly white can be had of very high efficiencies and admirable qualities in all respects, there seems to be no particular reason for the use of illuminants so strongly colored as to introduce the difficulties of heterochromic photometry in an exaggerated form. Such lights are merely phases of the development of illuminants, and in the long run, from a practical standpoint, lights which present a fair approximation to white, or at least which are not too strongly colored for convenient photometry, are likely to win out commercially. Nevertheless, heterochromic photometry will continue to be the subject of discussion and investigation, owing to its live scientific interest, and in time will without doubt be placed upon a perfectly satisfactory basis. Moreover, its study will have, incidentally, a useful effect in throwing side-lights on optical phenomena in general, and in hastening their correlation.

THE EFFECT OF TEMPERATURE ON THE MAGNETIC PROPERTIES OF ELECTROLYTIC IRON.

Until recently the purest specimens of iron were forgings obtained from Norway and Sweden. The magnetic behavior of steels and iron alloys used to be compared with the magnetic behavior of Norway iron. Recently, however, a method has been discovered for slowly depositing plates of iron electrolytically. Samples of electrolytic iron are stated to contain less than 0.1 per cent of impurity, and the bulk of this residual impurity consists of hydrogen. The February number of the *Physical Review* contains a paper, by Mr. Earle W. Terry, referred to in the Digest, on the magnetic properties, at different temperatures, of rings cut from plates of electrolytically deposited iron. The paper gives the results of much valuable research on this subject, although the illustrations are marred by an unfortunate inaccuracy in nomenclature, magnetic-field intensity being expressed in *dynes,* which is a unit of mechanical force and not a unit of magnetic force. The correct provisional name for the unit is the "gilbert per centimeter," or the "dyne per unit magnetic pole." The temperature range experimented in extended from —190 deg. C. with liquid air, to +1300 deg. C., a remarkably wide range. A noteworthy fact connected with the measurements is that these rings of very nearly pure iron were magnetically very hard in the initial state. Their coercive force at room temperature was found in one case to be 7.5 gilberts per centimeter at a flux density of 18.2 kilogausses. After being annealed at 800 deg. C. the same ring showed a coercive force of only 2.3 gilberts per centimeter at roughly the same flux density as before. The paper shows that not only do different sample rings of electrolytically pure iron show marked dissimilarities at low magnetic forces, but they all showed relatively high coercive force, and relatively low permeability at low magnetic forces. After being annealed at, say, 1000 deg. C., however, the initially observed differences tended to disappear, and the iron became magnetically softer.

It does not seem likely that the chemical condition of the iron was much changed by the annealing process, considering the high initial degree of chemical purity in the samples. Still less is it likely that the atomic or subatomic structure of the iron was altered by annealing. The microphotographs appended to the paper clearly indicate, on the other hand, that the molar structure of the metal was markedly affected by annealing. The original deposit of iron appears in mottled minute pebbly arrangement, whereas the annealed specimens show a marked larger crystalline structure. In other words, the process of annealing has changed the structure of the substance and has permitted the molecules to set in definitely crystalline formation. According to the tests, the total metallic flux density, or values of $B - H$, were not materially altered by annealing for large magnetizing forces; but the response to small magnetizing forces was materially assisted by the annealing. The most favorable temperature for annealing the samples proved to be 1100 deg. C. After annealing at this temperature the permeability reached, at its maximum, the large value of 11,000, with a magnetizing force of 0.5 gilbert per centimeter, an earth-field value. Although this electrolytically deposited iron is of great metallurgical, chemical and physical interest, it does not offer much inducement to the engineer. Its expense of production would naturally be much greater than that of open-hearth steel, and it would have no appreciable magnetic advantages over the latter in dynamo construction. At ordinary magnetizing forces, its permeability is not appreciably greater than that of good commercial cast steel. Moreover, its hysteretic loss with alternating magnetic fluxes would be greater than in cast steel owing to its higher retentivity.

In further illustration of the proposition that chemically pure iron is not at present considered desirable for use by the designer of dynamo-electric machinery, a paper appears this week in *Metallurgical and Chemical Engineering,* by Prof. Charles F. Burgess and Mr. James Aston, on the magnetic and electrical properties of iron-silicon alloys. It is shown in this paper that the addition of silicon to iron does not improve the permeability of the material at large magnetizing forces, but distinctly improves it at small magnetizing forces, with a diminution of hysteretic loss, as well as a diminution in the development of extra hysteretic loss with age. Moreover, the resistivity of the metal increases roughly 100 per cent for each 1 per cent of alloyed silicon, so that, taking the resistivity of pure iron as 10 microhm-centimeters, that of 1 per cent silicon-iron is about 20, and that of 5 per cent silicon-iron about 60 microhm-centimeters. This property of silicon is, of course, valuable in diminishing eddy-current losses. The conclusion both of the above papers point to is that when powerful magnetizing forces are used pure iron develops a greater structural m.m.f. and flux density than any brand of iron alloy yet tried. But when we deal with either moderate or feeble magnetizing forces, pure iron, i.e., iron with less than 0.1 per cent of impurities, is distinctly inferior to certain iron alloys, such as silicon-iron, especially if the pure iron is unannealed. In such cases we deal with the structural forces that resist the alignment and co-ordination of the molecular magnets. Properly selected impurities will necessarily diminish the total number of rotatable and alignable molecular magnets, but may greatly facilitate the rotation and alignment of the molecular magnets that remain. That is, the magnetic state may be evoked by feebler magnetizing forces.

A. I. E. E. Meetings.

The next regular meeting of the American Institute of Electrical Engineers will be held in New York on March 11, at which time papers dealing with electric mine hoists will be presented by Messrs. D. B. Rushmore, K. A. Pauly, W. Sykes and R. R. Seeber.

Papers added to the list on page 336 of our issue for Feb. 10, relating to the special meeting to be held in Charlotte, N. C., on March 30 and 31 and April 1, include one by Dr. A. E. Kennelly entitled "Modifications in Hering's Laws of Furnace Electrodes" and one by Mr. Carl Hering on "The Proportioning of Electrodes for Furnaces." An illustrated lecture relating to lightning phenomena will be delivered by Prof. E. E. F. Creighton.

At the New York meeting of the Institute to be held on April 8, Dr. Samuel Sheldon will present a paper entitled "Education for Leadership in Electrical Engineering."

To the list of papers to be read at a meeting of the Institute to be held in San Francisco on April 21, 22 and 23, printed in our issue for Feb. 10, has been added a paper by Mr. A. M. Hunt entitled "Emergency Generating Stations for Service in Connection with Hydroelectric Transmission Plants Under Pacific Coast Conditions."

The Boston Section of the Institute will hold a joint meeting with the American Society of Mechanical Engineers at the Massachusetts Institute of Technology on March 11, at which time a paper entitled "The Training of Men" will be presented by Mr. M. W. Alexander.

The British Illuminating Engineering Society.

At the first annual dinner of the British Illuminating Engineering Society, which was held in London on Feb. 10, the speakers included representatives from a large number of societies interested in illumination, the keynote of the addresses being co-operation. Among the speakers were Sir Henry Trueman Wood, secretary of the Royal Society of Arts; Mr. J. W. Helps, president of the Institution of Gas Engineers; Mr. W. Mordey, past-president of the Institution of Electrical Engineers; Prof. A. D. Waller, treasurer of the Physiological Society; Col. Lane Notter, deputy chairman of the Royal Sanitary Institute; Mr. Stanley Hamp, of the Royal Institute of British Architects; Dr. T. M. Legge, government medical inspector of factories; Mr. W. Finlay, president of the Electrical Contractors' Association.

Annual Ithaca A. I. E. E. Dinner.

One hundred and five members of the Ithaca Section, A. I. E. E., attended the third annual dinner given Friday, Feb. 25, in the assembly rooms of Sibley College, which were decorated in a manner appropriate to the occasion.

The tables were arranged in a large U and were lighted, at the beginning of the dinner, by candles held in high-tension insulators as candlesticks. A belt-line miniature railway circled the speakers' table and served as a means for transportation of cigars. A third-rail track was laid the whole length of the U table, some 150 ft., and a miniature interurban car made speed tests up the straight stretches. Suitable favors from several manufacturing companies were placed at each table. At one end of the hall the Institute emblem was displayed in small electric lights of different colors. The various types of lamps, including carbon-filament, tungsten, arc and mercury-vapor, were used in the lighting of the table. During the dinner songs and limericks were freely used characterizing various members of the Institute and faculty.

The list of speakers, including Dr. E. Nichols, toastmaster; Professors Smith, Kimball, Karapetoff and Norris, made brief addresses, while Mr. Wm. McClellan, of Campion & McClellan, New York City, gave the principal address of the evening. A resolution that greetings be sent to Prof. H. J. Ryan, now at Palo Alto, Cal., founder of the electrical engineering department at Cornell, was passed and a telegram was dispatched by the secretary. A vote of thanks was also extended to the committee for its excellent work in behalf of the section in organizing the dinner. Their ingenuity was especially evidenced on the unique programs, which were printed and donated by Taylor & Carpenter.

Mr. W. J. Davis, of the Davis-Brown Electrical Construction Company, of Ithaca, furnished the electrical display; Treman King & Buttrick and Frawley also contributed toward the arrangements. The catering was done by Miss Flannigan, who served a generous and appetizing dinner. The committee consisted of Mr. E. A. Phillips, chairman; Messrs. H. F. Penney, T. E. Orbison and R. H. Harrison, sub-chairmen; and Messrs. J. W. Davis, M. A. Rusher, H. C. Bossinger, T. E. Yoakum, S. B. Kent and A. W. Cornell.

The Federal Incorporation Bill.

By George Hiram Mann.

The new Federal Incorporation bill, drawn by Attorney-General Wickersham and endorsed by President Taft, is now before Congress for its consideration. It has been referred to the committees on Judiciary in the Senate and House. It is easily conceded that this bill contemplates the most important and radical changes during the last half century in the jurisprudence of the United States.

About the most important person in these United States, if the new bill becomes a law as at present framed, will be the Commissioner of Corporations. This official is a subordinate officer in the Department of Commerce and Labor. The present Commissioner is Mr. Herbert Knox Smith, a man of great ability and stainless motives. Throughout the bill are found such phrases as "in his discretion," meaning the discretion of the Commissioner of Corporations, and "if he shall approve the same," and "the written approval of the Commissioner of Corporations," and other phrases like "If in his opinion the public interests shall so require." Indeed, the most casual reading of the new Federal Incorporation bill indicates an intent to place in the hands of the Commissioner of Corporations such great power as may well cause even the reckless to hesitate.

Even the right of appeal to the district or circuit courts of the United States seems altogether an after-thought and certainly these courts would have great trouble in undoing the harm which might be done to corporations by a reckless or corrupt commissioner.

The bill, which is of some fifty pages in length, contains the usual provisions of most State statutes providing for the formation of corporations. The approval, which is usually required by the Secretary of State of one of the States, is here to be given by the Commissioner of Corporations. A perusal of the act, however, brings us to the phrase in section 3, "it shall be the duty of the Commissioner of Corporations to examine such articles of association and if, *in his opinion*, they conform to the requirements of this Act, and contain no provision which is contrary to any other Act of Congress, etc., etc., the same shall be approved." This being new legislation and in a field heretofore untrod, corporations will find that there is substituted the opinion of the Commissioner of Corporations in place of the well-defined body of law now existing in the States which give to the State corporation laws that one qualification so necessary for any stable business—certainty.

Following through the sections of the bill in sequence, the customary provisions for formation of new corporations in the progressive States is followed as far as they are adaptable for federal corporations.

An excellent provision for the cumulative voting for directors is found in section 7. Section 8 contains a prohibition of the acquisition by federal corporations of stock in a State corporation, the same carrying on like business. This section will evidently be the subject of much discussion in Congress.

It is in full as follows:

"No corporation formed pursuant to this Act shall purchase, acquire, or hold stock in any other corporation, nor shall any corporation organized under this Act or under the laws of any State or foreign country for the purpose of or engaged in carrying on the like business to that of a corporation formed pursuant to this Act, acquire or hold the stock of such last-mentioned corporation, and any attempted transfer of such stock contrary to this provision shall be null and void. No corporation formed pursuant to this Act shall by any implication or construction, be deemed to possess the power of carrying on the business of discounting bills, notes, or other evidence of debt, or of receiving deposits or buying and selling bills of exchange, nor shall it issue bills, notes, or other evidence of debt for circulation as money."

The directors are required to be shareholders and the minimum number of directors shall be five. They shall be chosen annually. Right here may be noted a matter, the importance of which could hardly have been in the minds of the drawers of this bill. Section 9 provides that directors shall hold office for one year, or until others are chosen and qualified in their stead." Section 25 requires, "That in no case shall less than a majority of shares or amount of interest be required to be represented at any meeting in order to constitute a quorum." From this it will be seen that the holder of 51 per cent of the stock could keep the same directors in office indefinitely by merely remaining away from the corporation meetings. This, despite the provision for cumulative voting, which otherwise would allow the stockholders of 49 per cent to change some of the directors.

Section 9 further provides for an executive committee from the board of directors, "composed of not less than a majority of the whole number of directors, to be chosen by the votes of a majority of the whole board, which committee shall have and may exercise, except when the board is in session, all of the powers of the board, except such as are by this Act required to be exercised by the board of directors itself, and except the power to declare dividends; and may also provide that the members of the board of directors other than those constituting the executive committee shall not be liable in any respect except for the exercise of good faith and due diligence in respect to matters brought before meetings of the board of directors duly held and attended by them."

Section 11 provides for the creation of two or more kinds of stock. It further provides, however, that "at no time shall the total amount of preferred stock issued and outstanding exceed two-thirds of the capital stock paid for in cash or property, and any class of preferred stock may, if desired, be made subject to redemption at a price not less than the par value of said stock, if it have any par value, otherwise at not less than a price to be specified in the certificates of said stock; and the holders of such preferred stock shall be entitled to receive and the corporation shall be bound to pay thereon dividends at such rates and on such conditions as shall be stated in the Articles of Association or Amended Article, quarterly, half-yearly, or yearly, and such dividends shall be made payable before any dividends shall be set apart or made payable on the common stock, and such dividends may be made cumulative."

This section further provides that unless the original articles of association authorize preferred stock none may be issued save with the consent of the holders of two-thirds of each class of outstanding stock.

Section 12 provides for a stock book at the principal office, "which stock book shall at all times during the usual hours for business be open for the inspection of its stockholders, judgment creditors, and officer authorized by law to investigate the affairs of such corporation," under a penalty of $50.

Section 14 requires all subscriptions to capital stock if payable in money to be accompanied by ten per cent cash at the time made.

Section 17 contains many important provisions controlling issues of stock for property. Every stock certificate so issued must contain a statement that the same was issued for property purchased. Further all reports must show such stock as having been issued for the property purchased. But the foregoing are mild compared with the further requirements of this section which are here quoted in full:

"Provided, however, that before any such stock is issued, there shall be filed in the Bureau of Corporations a statement in writing, signed and sworn to by a majority of the members of the board of directors, setting forth:

"(a) A full description of the property in payment for which the stock is to be issued.

"(b) The number of shares agreed to be issued in payment for said property, and whether or not such shares are to have a par value, and if so, the aggregate par value of the stock so issued; or if such shares are to have no par value, then the number of shares to be so issued.

"(c) The names and addresses of the vendors of the property purchased or acquired by the company, or proposed to be so purchased or acquired with the stock so issued, and whether or not they or any of them are officers or directors of the company, and whether or not they are to the knowledge of the signers of the statement or any of them owners in their own name or otherwise of any shares of stock in the corporation, and if so, how many of such shares.

"(d) The terms of any existing agreement, verbal or written, for the transfer of such property to the corporation and the parties to all such agreements, and particularly the amount paid or payable as purchase money in cash or shares for such property, specifying any amount payable for good will, and all amounts paid or intended to be paid for such property to each vendor; and in case any written contract has been made with such vendors, or any of them, a sworn copy thereof shall be filed with such statement.

"(e) In case the vendors of said property, or any of it, are directors of the corporation or owners of any of its stock in their own names or otherwise, a statement of the prices paid or agreed to be paid by them for the property so to be sold or transferred to the corporation, and copies of all contracts by which the said vendors of said property to the corporation acquired the ownership or the control thereof.

"(f) In case the stock to be issued in payment for said property shall have a par value, there shall be filed with such statement in the Bureau of Corporations an appraisement of the value of such property made by two disinterested appraisers, approved in writing by the Commissioner of Corporations; and the commissioner may, in his discretion, appoint one or more other appraisers to make valuations of such property, and shall fix the compensation of such appraisers, which shall be paid by the corporation before the approval of the issue of such stock, and no stock having a par value shall be issued in payment of property purchased or acquired by the corporation to an amount of such par value in excess of the value of said property as approved by the Commissioner of Corporations after such appraisement.

"(g) In case any corporation formed hereunder shall be organized for the purpose of taking over the property and business of any existing corporation formed under the laws of any State or Territory of the United States, or of the Acts of Congress relating to the District of Columbia, and engaged in interstate commerce of the character proposed to be carried on by the corporation formed hereunder, pursuant to any plan or reorganization or reincorporation of such existing corporation, the Articles of Association shall set forth a copy of such plan as may have been agreed upon for such purpose by the directors of said existing corporation, and approved by the holders of not less than two-thirds of each class of its capital stock given at a meeting duly called, to consider the same, which plan shall specify what provisions are to be made for the payment or security of the indebtedness of said existing corporation. It shall be the duty of the Commissioner of Corporations, on the presentation to him of any such articles, to inquire into the fair value of the property and business of the said existing corporation as a going concern, and for

such purpose he may employ one or more appraisers to make an examination and appraisement of the property and business of said corporation, whose expenses shall be paid by or on behalf of the corporation proposed to be formed hereunder; and if, as a result of said appraisement he shall be of opinion, and shall so certify in writing, that the total amount of stock and securities having a par value proposed to be issued by the corporation formed hereunder pursuant to such plan shall not exceed the fair estimated value of the property and business to be transferred to the new corporation, he shall indorse his approval upon said certificate and file the same in the Bureau of Corporations and issue to the incorporators named therein a certified copy of said Articles of Association, together with a certificate of his approval in form specified in Schedule C of this Act; and thereupon the said new corporation shall be empowered, upon the conveyance and transfer to it of the property and business of said existing corporation, in accordance with the laws of the State, Territory, or district wherein the same is incorporated, to issue in payment therefore the stock or other securities, and assume the payment of any outstanding obligations which by said plan of reorganization or reincorporation, it is provided shall be assumed by said new corporation to the extent specified in said Articles of Association as so approved. The said plan shall, however, contain such provisions for the payment of non-assenting stockholders in said existing corporation of the fair appraised value of their stock as the Commissioner of Corporations may specify and require.

"The approval by the commissioner of the value of said property, or of property and business given pursuant to any of the provisions of this section, shall be conclusive as against the corporation and its stockholders and creditors; but in case any statement required by this section shall be false in any material respect, the directors uniting in a statement made pursuant to the provisions of this section shall be jointly and severally liable to all subscribers to, holders and purchasers of such stock, as well as to all persons to whom the corporation may thereafter become indebted, for any damage sustained by them by reason of the issue of such stock or the purchase thereof or the extension of credit to such corporation in reliance upon the truth of such statement, and in any action to recover such damages, brought by any purchaser of such stock, or creditor of such corporation, other than one of such directors or his personal representatives, it shall be presumed that all stock purchased or credit extended after such statement was filed as in this section provided was purchased or extended in reliance upon the truth of such statements, and the burden shall be upon the defendants to show that the purchaser or creditor had no knowledge of and did not rely upon such statements."

The reader will have noticed in the foregoing the duty of the Commissioner of Corporations "to inquire into the fair value of the property and business of the said existing corporation as a going concern, and for such purpose he may employ one or more appraisers to make an examination and appraisement of the property and business of said corporation whose expenses shall be paid by or on behalf of the corporation proposed to be formed hereunder; and if, as a result of said appraisement he shall be of opinion and shall so certify, etc." These words speak so loudly that comment upon them is needless.

Reports as of January 1, or July 1, whichever date the Commissioner of Corporations shall elect, are required to be filed in such form and setting forth such details as the Commissioner of Corporations from time to time shall prescribe. The commissioner also has power to call for "special reports from any particular corporation whenever, in his judgment, the same are necessary in order to secure a full and complete knowledge of its condition.

Besides the above reports every corporation is required to report to the Bureau of Corporations "within 10 days after declaring any dividend, the amount of such dividend and the class or classes of stock on which payable and a copy of the statement of the financial condition of the corporation, showing the amount of the net earnings of such corporation on hand at the time of declaring such dividends; which report shall be attested by the president, vice-president, or treasurer of such corporation."

The usual provisions for filing certificates upon payment of installments of capital stock are found in section 19.

Two-thirds of the holders of stock may, with the consent of the Commissioner of Corporations, increase or reduce the capital stock.

Provisions forbidding the payment of dividends except from surplus, make the direction financially responsible, jointly and severally, for a period of 6 years.

Section 24 is important in that it contains the provisions for raising money and the issuance of bonds. The regulations covering this are so cumbrous and complicated as set forth in the present bill that it is hardly worth while to take space to quote them in full here. Suffice it to say, that the supervision of the general business of a proposed federal incorporation which the bill gives to the Bureau of Corporations, reaches its maximum in this section.

Section 26 provides for inspectors and elections.

Section 28 forbids civil suits exceeding $2,000 against a corporation except in the courts of the United States. This section also requires a filing of a written power of attorney from the corporation to a person in each judicial district in which it transacts business to receive processes on behalf of the corporation.

Section 29 provides for liquidation and dissolution of a corporation by a vote of two-thirds of stockholders present at a meeting called to consider the proposed dissolution.

Section 30 allows the sale and transfer of all the property of a corporation for cash, or wholly, or in part in the capital stock of any corporation organized under this law provided 80 per cent of each class of stockholders, at a special meeting, consent.

Section 31 is an interesting illustration of the minute care with which the Federal Government proposes to supervise corporations. It provides "whenever any corporation formed hereunder shall have failed to pay off any of its written obligations at the time and place at which the same are payable, or an execution against its property shall have been returned unsatisfied, the Commissioner of Corporations may appoint a special agent, of whose appointment immediate notice shall be given to such corporation, who shall proceed forthwith to ascertain whether or not the said corporation is in such an unsound financial condition as to make it inexpedient that it should continue in business, and if upon such report so made the Commissioner of Corporations is satisfied that the said corporation is either insolvent or of such unsound financial condition as to make its continuance in business contrary to the public welfare, he may forthwith appoint a receiver of such corporation and require of him such bond or other security as he deems proper. Such receiver, upon the approval by the commissioner of his bond or other security, shall be and become entitled to the possession of all the real and personal property of such corporation for the purposes of carrying out the provisions of this act and shall have all the powers of a receiver appointed by a court of equity. He shall, under the direction of the commissioner, take possession of the books, records and assets of every description of such corporation, collect all debts and claims due to it, and upon the order of a court of competent jurisdiction may sell all property of the corporation, or as much thereof as may be necessary to pay the debts of such corporation.

"The commissioner shall, upon appointing a receiver, cause notice of such appointment requiring all persons having claims against such corporation to present the same in writing, duly verified, to the receiver, within a time in such notice specified, not less than 30 days from the date of the first publication of such notice, to be given by publication in one or more newspapers of general circulation published at the place of the principal office of such corporation, or if none be published at such place, then at the nearest place thereto."

Section 33 contains an interesting provision whereby a corporation desiring to deny insolvency may, at or before the expiration of 30 days after it has been notified of the appointment

of a receiver, apply to enjoin further proceedings in the premises and after the decision of the court or finding of a jury that such corporation is not insolvent the court shall issue an order enjoining the commissioner from further proceedings. This section also contains the soothing words "all expenses of any preliminary or other examination of the condition of such corporation shall be paid out of the assets of such corporation before the distribution of the proceeds thereof."

Section 34 is extremely important. It reads:

"No corporation formed hereunder shall be subject to any visitorial powers other than such as are authorized by this act or are vested in the courts of the United States."

Section 35 provides that "corporations formed hereunder may be adjudged bankrupts, either voluntary or involuntary, subject to the provisions of the national bankruptcy law."

"Section 36. The charter of every corporation formed hereunder shall be subject to alteration, suspension and repeal in the discretion of the Congress and the Congress may at pleasure dissolve any such corporation.

"In case any corporation organized under this act shall enter into any contract or combination or engage in any conspiracy in restraint of trade or commerce among the several States or with foreign nations, or shall monopolize or attempt to monopolize any part thereof contrary to the provisions of the act of July 2, 1890, or shall otherwise violate the laws of the United States, its charter shall be forefeited and the Attorney-General of the United States may bring proceedings to enforce such forfeiture in any circuit or district court of the United States for the judicial district in which the principal office of such corporation is located, and in any such proceeding the court may, in its discretion, appoint a receiver of the property of such corporation either during the pendency of the proceeding to preserve the property and cause the business to be conducted in a lawful manner, or by final degree to aid in the liquidation of its affairs.

"This act may be amended or repealed at the pleasure of the Congress, and every corporation created under this act shall be bound by such amendment, but such amendment or repeal shall not take away or impair any remedy against such corporation or its officers for any liability which shall have been previously incurred. This act, and all amendments thereof, shall be a part of the charter of every corporation formed hereunder, except so far as the same are inapplicable and inappropriate to the objects of such corporation.

"Section 37. The real and personal property of every corporation formed under this act shall be subject to taxation for State, county and municipal purposes in the State, Territory, or district where the same is located, but at no higher rate than other real and personal property of the same character in said State, Territory or district. Nothing herein contained shall prevent the shares in any such corporation from being included with other personal property for taxation under the laws of the State in which such owner or holder resides. But no tax shall be imposed under State authority upon the franchise or privileges granted by this act to any corporation organized pursuant to its provisions."

It may be interesting in view of the radical innovations proposed above to read the subjoined excerpts from the report of the Commissioner of Corporations which has just been made public. Commissioner Herbert Knox Smith says:

"The deepest interest of this generation lies in the control of its dominant commercial forces. The issue is moral, involving deeply our American ideal of equal opportunity under the law. It is financial, and on its outcome depends the ultimate stability of our business system."

After citing the growth of corporations and the abuse of the great powers which they undoubtedly possess, Mr. Smith continues:

"The issue is national, action by the Federal Government is imperative under its unquestioned power and duty to regulate interstate commerce. The Federal Government is the only adequate authority; one of the primary motives for its creation was for a national control of national business. Those directing our great corporations have deliberately nationalized them in size and scope; they cannot now be heard to object to a centralized control which they themselves have made necessary. They have made their business truly governmental in their effect on the people. They cannot now deny that the Government is concerned therein."

Referring also to the Government as "the guardian of the nation's welfare" and contrasting the good and bad types of corporation managers, Mr. Smith proceeds to assert:

"Through the Bureau of Corporations, the Federal Government has deliberately taken the side of the fair user of our commercial forces. The instrument of the bureau in its work has been 'efficient publicity.' It has relied on the moral sense of the American people, and its compelling force when concentrated intelligently on a business wrong. It has reported to the country clearly and accurately, the operations of great industries. Business facts and their meaning have been set forth in such brief and plain shape as to be available through the press for the average citizen. It has thus evoked that intelligent public opinion that will protect honest business and condemn unfair practices.

"In short, our great interstate industries must come under permanent national supervision."

One comfort in this important situation is this, that the whole subject of the federal powers and of the desirability of placing corporations under federal control will be thoroughly discussed. Whatever is decided will voice the serious decision of the country's best thinkers.

Electricity Offered at Low Rates for New City Hall, Chicago.

Chicago is building a new city hall, and on specifications prepared by Holabird & Roche, the architects, bids for electric service being opened by the commissioner of public works on Feb. 26. The term of the proposed contract is to be not less than five years, and a minimum consumption of 600,000 kw-hours per year is specified. The total connected load of the large building will be approximately 15,000 16-cp, 115-volt, 56-watt lamps and 1191 hp in motors. Motors are to be operated at 230 volts, direct current, and the lamps at 115-230 volts, alternating or direct current. The motor load will be about as follows: Elevators, 450 hp; ventilators, 375 hp; fire pumps, 270 hp; house pumps, 30 hp; vacuum cleaning, 15 hp; refrigeration, 15 hp; pneumatic tubes, 20 hp.

Bids were received from the Commonwealth Edison Company and the Sanitary District. Both were at a low rate, that of the Sanitary District, which generates electricity from the water-power of the Chicago Drainage Canal being remarkably low. The proposal of the Commonwealth company, including lamp renewals for lighting, using carbon-filament lamps, was 2.59 cents per kw-hour for 450,000 kw-hours per year (the proportion of the total to be used for electric power) and 3.09 cents per kw-hour for 150,000 kw-hours per year (the proportion of the total used for electric lighting), on the basis that the average use of the combined maximum demand of both light and power is 7.2 hours a day. Exclusive of lamp renewals, the Commonwealth company will supply electricity at 2.59 cents per kw-hour for all electricity consumed on the basis that the average use of the combined maximum demand of both light and power is 7.2 hours a day. No extra charge will be made in the case of either proposal for two or more sources of supply cross-connected. If the quantity of electricity used is greater than 600,000 kw-hours, or if the use of the maximum demand is more than 7.2 hours per day, then the rate per kw-hour will be reduced automatically, according to the regular wholesale-rate schedule of the company. Attention is called to the fact that the company will not need the 4000 sq. ft. of space in the basement of the city hall, which the city undertakes to provide and which may be used, therefore, for other purposes. Also the net cost to the city will be in reality 3 per cent lower than quoted above, owing to the municipal compensation paid by the company to the city.

If it is allowed to use certain 12,000-volt cables and overhead

lines owned by the city, the Sanitary District will make a rate of 1 cent per kw-hour on the basis of not renewing lamps and 1¼ cents per kw-hour on a basis of renewing the lamps. The district offers to bring its service wires to the main distributing board in the engine-room of the new city hall and furnish at the city's board 230-volt direct current for the power circuits and 115-volt direct current for the lighting circuits. The district will install and operate all transformers, motor-generators, meters, voltage regulators, etc., iu the basement of the city hall necessary for the service, the price quoted being for electrical energy delivered at the board, with no other expense to the city. The equipment in the basement of the city hall will be installed in duplicate. The district submitted four proposals. For one conducting cable from its terminal station to the city hall and for one source of supply; the price quoted is 1¼ cents per kw-hour, including lamp renewals; for one cable and one source of supply, 1 cent per kw-hour, not including lamp renewals; for two cables and two sources of supply, 1¼ cents per kw-hour without lamp renewals, or 1½ cents per kw-hour, including lamp renewals. The two cables means the installation of a reserve cable to the terminal station and the two sources of supply means the installation of a storage battery. The new cables are to be laid underground.

These bids were taken under advisement by the city authorities.

Opposition to St. Lawrence Power Company.

The plans of the St. Lawrence Power Company to utilize the power of Long Sault Rapids, as recently described in these columns, are meeting with much opposition. The next battle to be fought on this question will be at Ottawa in connection with the proposed bill to incorporate the St. Lawrence Power Transmission Company. The situation is interesting in that Mr. F. H. McGuigan, contractor for the building of the Hydro-electric Commission power transmission line from Niagara Falls through Western Ontario, is the head of the corporation now seeking authority to build the dam on the St. Lawrence River near Cornwall, where the power generated will be transmitted partly across the border and sold in the United States, and partly distributed in the counties of Leeds, Grenville, Stormont and Glengarry, and possibly a portion transmitted to Montreal. The Hydro-electric Power Commission is strenuously opposing the bill, claiming that the operations of the company will seriously interfere with the work of the commission. In an interview, Hon. Adam Beck, chairman of the commission, pointed out that the bill was a menace to the successful working out of the Ontario Government's power policy in eastern Ontario, in that its adoption would mean a dual system of power supply with all the embarrassments such a condition invariably entails.

"The purpose of the proposed company," said the Minister of Power, "is not to supply the small consumers or serve them for a distance. It looks for a home market and a sale in large quantities. The commission wants the power for distribution on the same plan as that adopted in the west. Our object is to supply power at cost to all municipalities that can be advantageously reached."

From eastern Ontario, toward which the attention of the commission is now being directed, applications for power have been received from Kingston, Belleville, Deseronto, Brockville, Oshawa, Cobourg, Bowmanville, Port Hope, Picton and Durham, while reports have been made for Prescott, Napanee, Peterborough, Madawaska, Almonte and Renfrew.

"If the proposed bill is passed," stated Hon. Mr. Beck, "the company would have authority to transmit power into a large section of the territory to be supplied by the commission, and a dual system of transmission would result. The commission has always considered that where municipalities are prepared to co-operate and so increase the demand for power from one source, that a dual system is a hindrance to municipalities in the working out of their plans, and such a system should not be encouraged."

New Telephone Buildings in Chicago.

Announcement is made that the Chicago Telephone Company will erect an extension of its present headquarters building at Washington and Franklin Streets, adjoining that building on the east. The new building will have a street frontage of 80 ft. and will be 90 ft. deep. It will be 15 or 16 stories high at first, although foundations will be put in for a building of 22 stories, so that the upper stories may be added later. The building will be used, at first, principally for the offices of the company. The business has grown so rapidly that the present office building has long been inadequate for the requirements of the company. About 400 people occupy offices in the Occidental Building at Washington and Market Streets, one block west of the headquarters building. Here the engineers are located and also the superintendent of outside plant and the superintendent of inside plant, with their respective forces. The new office building will permit the assembling of all the headquarters staff of the company under one roof. The space vacated in the present office building by the removal to the new one will make possible extensions of the Main and Franklin exchanges. It is also possible that some of the space in the new office building may ultimately be used for operating purposes, although it is not the present intention to do any operating in the new building. It is possible that the American Telephone & Telegraph Company will also have its Chicago offices in this new building. The building will probably cost about $1,000,000. Although the new edifice will adjoin the present telephone building, no attempt will be made to have it conform with the old building in architecture.

The central business district of Chicago is constantly encroaching on former residence districts, and this is particularly the case at the southern margin of the "Loop" district. To accommodate this growth, a marked increase in telephone facilities is needed, and the Chicago Telephone Company is erecting a new telephone exchange building to be known as the Federal Exchange, on Federal Street, near Harrison Street. The foundations for this building are now in. When completed, the Federal Exchange will have a capacity for serving about 30,000 telephones. The building will be seven stories high, but will be so constructed that nine additional stories may be added.

A report to the city comptroller shows that the gross receipts of the Chicago Telephone Company for the last six months of 1909 were $4,423,298. This statement was accompanied by a check for $132,699, in payment of the municipal compensation for the half-yearly period covered by the report on the basis of 3 per cent of the gross receipts.

Extension of North Shore Electric Company in Illinois Lakes Region.

By purchase from the Illinois Lakes Light & Power Company, of Chicago, the North Shore Electric Company, which operates in the suburban territory and near-by country around the city of Chicago, has secured electric lighting plants in the villages and cities of Dundee, Barrington, Crystal Lake, McHenry and Antioch, in Kane, McHenry and Lake Counties. The territory thus served covers the lake region of northern Illinois and is a favorite place of resort in the summer time for people living in Chicago. It contains many summer hotels and resorts, as well as a large number of summer cottages. By this extension the North Shore Electric Company adds to its territory approximately 700 sq. miles. The total area served by the company is now about 1240 sq. miles. This is about the area of the State of Rhode Island and is one-half the area of the State of Delaware.

The nearest North Shore generating station is at Waukegan, Ill. There is also a generating station at Evanston, Ill., and these are connected by a 20,000-volt transmission line running north and south. About eight miles south of Waukegan is a substation at Lake Bluff, and as the new territory acquired lies west of Waukegan, a new 20,000-volt, three-phase, 60-cycle

transmission line is to be built, tapping into the existing transmission line at Lake Bluff and being built in the form of a loop or ring enclosing the territory served and coming back to Waukegan. Built in this ring shape, this line will virtually be a duplicate line, for it may be fed into either from the Waukegan or the Lake Bluff end. This new transmission line will run southwest from Lake Bluff to Barrington. At Barrington it will proceed northwest to Crystal Lake and then north to McHenry and east to Waukegan. Work is already under way on that portion of this transmission line between Lake Bluff and Crystal Lake by way of Barrington.

In the new territory which has been acquired, the summer-resort people and the cottagers are eager for electric light and electrical conveniences to which their patrons or they themselves are accustomed in the city. This summer business is largely off-peak load and therefore desirable for the central-station company. There is also considerable motor load to be had in the shape of small factories, while some of the plants absorbed do municipal water pumping.

Substations will be located at Barrington and Crystal Lake, and there will be others, the location of which has not been definitely fixed. The existing plants in the territory served are old ones and will be shut down as soon as arrangements can be made to supply customers from the new substations. It is interesting to note that the stations at Antioch and McHenry are gas-producer plants.

Business Men Should Co-operate with the Postoffice.

Mr. John M. Hubbard, assistant postmaster of the Chicago post office, addressing the Electric Club of Chicago on March 2 on "Postal Progress," said that the postal service touches everybody more intimately than any other department of the Government. He said that when he went with the Chicago post office in 1871, the annual receipts were about $500,000, whereas they are now about $16,000,000. The Chicago post office has 46 carrier stations and 275 numbered substations. Seven hundred tons of mail are handled in Chicago daily. It is of importance to business men that they co-operate with the post office. The speaker told of one commercial house that spent $75,000 a year for postage, where the handling of that amount of business was put in the hands of office boys. There should be responsible men in charge of the mailing departments of large commercial houses. These mailing clerks should be familiar with the Post Office Guide and conversant with railroad schedules and the time of arrival and closing of mails. The last man or boy coming into a business should not be considered good enough, as is usually the case, to take charge of the postoffice end of that business. Mr. Hubbard spoke of the advantage of getting mail in the post office early in the day and expressed his satisfaction that the men in the postal service are not now the creatures of politics as they were when he first entered it. He remarked that the receipts of the Chicago post office are about one-twelfth the entire receipts of the Post Office Department, and that about one-eighth of all second-class mail originates in Chicago.

Massachusetts Electric Railway Conditions in 1909.

The annual report of the Massachusetts Railroad Commission, covering the year ending Sept. 30, 1909, contains the usual statistical analysis of electric transportation conditions within the State, and indicates that the companies are continually progressing toward more efficient standards of operation. Improved business conditions are indicated by the traffic and revenue for the year. The total length of main track operated in the State is now 2765 miles, and the gross assets of the 78 operating companies are $177,745,988. The surplus is now 11.29 per cent of the capitalization. The average rate of dividends declared by 40 companies was 5.1 per cent of the total capital stock, the rest of the roads paying no dividends. Dividends ranged from 10 per cent to 2 per cent. The total cost of the properties per mile of track is $58,580, and the capital investment per mile $58,337, showing the entire absence of inflation or "watering" in these securities.

The gross income of the companies for the year was $33,657,478, and the operating expenses were $20,915,728. The roads carried 624,532,753 passengers, or over 22,132,000 more than in 1908, and ran 117,493,499 car-miles. The ratio of expense to earnings was 65.45 per cent. The average earnings per mile of track were $11,899. The average receipts per car-mile were 27.19 cents, and the operating expenses were 17.80 cents, leaving net earnings at 9.39 cents, compared with net earnings of 8.75 cents a year ago. The operating cost per car-mile in 1908 was 17.56 cents. The gross earnings per passenger were 5.12 cents and the net 1.77 cents, while the operating expenses per passenger were 3.35 cents, compared with 3.41 cents a year ago. The roads employed 17,575 persons, and owned 7546 cars. The total number of electric motors was 16,526. There were 190 less accidents than in 1908.

Proposed Ohio Public Utilities Legislation.

The Woods public utilities bill, now before the Ohio Legislature, is reported to stand in imminent danger of defeat. The general understanding had been that President Taft desired the enactment of such a law in his own State and that it had been framed after his suggestions. However this may be, it became known that the President had stated that he did not know what the bill contains and this spoiled the ardor of many of the members of the Legislature who had stood for it. Others had grown lukewarm previously, as a very hard fight has been made against it by the railroads, electric railway companies, telephone companies and, in fact, all other utility corporations, because of the too drastic measures it contains.

Another measure receiving much attention at Columbus is the Langdon bill, which seeks to establish a State tax commission which would take the work of making appraisals out of the hands of the various boards that now have charge of them. This has been very bitterly fought. Attorney-General Denman has advised that the Nicholas law, which provides that the capitalized value of corporations be taken into account in making the assessments, be extended to all public-service companies. Of the two plans, the companies would probably favor the Langdon bill.

Ohio Independent Telephone Situation.

The directors of the United States Telephone Company, at a meeting held in the offices at Cleveland, Ohio, last Saturday, adopted a resolution giving the president, Frank A. Davis, authority to readjust the toll rates to meet the competition of the Bell companies which have remained at the reduced figures made when competition assumed the proportions of a rate war 15 or 18 months ago. While the meaning of this action is not clear, it is evident that there is to be either an even or a competitive rate, as may be decided by President Davis. The resolution is as follows:

"Be it resolved, That, owing to the fact that certain rates of competing companies are in cases detrimental to the interest and good will of the United States Telephone Company and those it serves, we hereby authorize the president of the United States Telephone Company to reduce, fix or adjust the toll charges of this company for service at such rates as he may deem best and expedient, and to make such regulations pertaining thereto as will best preserve the good will and business of this company and will best subserve the good will and interests of the companies connected therewith, and

"Be it further resolved. That the president be authorized to put said new rates into effect at such times as in his judgment will best subserve the purposes for which this authority is given, and that from time to time the president be and he is hereby authorized to adjust and readjust said rates and charges for toll service, to the end that the good will and business of

this company may be at all times fully protected, maintained and preserved."

Shortly after the control of this company passed into the hands of J. P. Morgan & Company the rates were readjusted by the board of directors in such a way as to make them so high to certain points that much complaint resulted. It was even charged by some that an attempt was being made to drive the business to the Bell companies, which retained the old cut rate made during the fight for business. The board is differently constituted now and it may be to this fact that the change is due.

At this meeting Clarence Brown, of Toledo, who had been the attorney of James S. Brailey, Jr., for some years, resigned as counsel for the company, and B. H. Brooks, of Columbus, was elected engineer in place of Engineer Sinstone.

Mr. E. W. Moore presented his resignation as a member of the board of directors of the Cuyahoga Telephone Company at an adjourned meeting of that body Saturday, and Frank A. Davis, president of the United States Telephone Company, was elected to succeed him. C. Y. McVey was also elected as a member of the board to succeed Barney Mahler. Mr. McVey was elected vice-president and general manager. For some years he has been the manager of both the Cuyahoga and United States Telephone Companies, but the recent changes in the location of the offices of the latter and other plans that have been worked out, makes a manager for each necessary. H. O. Leinard was chosen treasurer to fill the vacancy made by the recent resignation of William L. Ross. C. F. Haskins will be the auditor.

The directors authorized the payment of the regular quarterly dividend of 1½ per cent to stockholders of record of April 15, payment to be made on April 30. The report of the general manager showed very satisfactory results. The new Princeton exchange has been put into operation and this greatly relieves the main exchange.

Mr. H. P. Davidson, of J. P. Morgan & Company, and F. W. Stevens, the personal representative of the firm on the boards of directors on the various companies controlled by it, made a tour of inspection through Ohio last week, spending the principal part of their time at Cleveland and Columbus. The exchanges and equipment of the systems were inspected carefully, although neither of the men make any pretensions of being experts in the telephone business. Mr. Davidson assured the Independent men that the firm had no ulterior motives in the purchase of the controlling interest in the several companies and that there is no intention to turn them over to any other interests. He said they would all be operated as Independent companies and that money would be furnished for all necessary improvements and extensions to put them in the best condition. His firm, he said, expected to work in close cooperation with other Independent companies and assist them in widening their field and extending the use of the telephone in general. The conclusions to be drawn from what Mr. Davidson said are that everything will be done to make the properties what they should be and that they were purchased by the firm merely because they offered what was thought to be a good investment.

At Cleveland the gentlemen were the guests of President Charles A. Otis, of the Cuyahoga Telephone Company, and at Columbus they were entertained by Frank A. Davis, president of the United States Telephone Company and Columbus Citizens' Telephone Company. At both places they met a number of business men and talked the situation over with them.

Answers to the suits filed by representatives of the dissatisfied Independent interests to prevent the transfer of stock to Bell companies were made Saturday. They consist of a general denial of the allegations contained in the petitions and their amendments. The American Telephone & Telegraph Company denies that it conspired with the other defendants in the sale of the voting certificates held by them and that it purchased any stock in behalf of any trust or combination. It also denies that it has any interest in the management of the Independent companies.

F. H. Goff, president of the Cleveland Trust Company, states in his answer that he has no information as to the ownership of the voting certificates, nor the alleged attempts of the Bell companies to restrict competition in any way. He said he acted for the Everett-Moore syndicate and disposed of its holdings to R. L. Day & Company.

The answers of the Central Union Telephone Company and the Cleveland Telephone Company are to the effect that they did not conspire with the other defendants in the sale of the stocks and voting certificates and that they are not the owners of these stocks, as charged. They further assert that they have no interest in the management of the Cleveland Telephone Company.

Charles W. Wason states in his answer that his belief is that F. H. Goff sold the stocks to R. L. Day & Company and that they in turn sold them to J. P. Morgan & Company.

A battle royal has been waged at Columbus the past week over the Elson bill, which if made a law, would permit the merging of telephone companies, notwithstanding the provisions of the Valentine anti-trust law. Opponents of the bill are seeking to delay any action on it, until a vote is taken on the Woods general utilities bill. If this bill is made a law, the commission created would exercise such supervision over the merger agreement of companies and the rates that would be made, that the effect of merging competing companies would not be bad. But there are now serious doubts as to the ultimate success of the Woods bill, and the opponents of the Elson bill are put to hard straits.

It is said that representatives of the Bell interests are working very hard for the enactment of the Elson bill in the belief that they would be able to unite all the long-distance systems in the State. Fearing that it will be impossible to secure the enactment of the bill in its present form, however, they have agreed that all the contracts between merging companies shall be submitted to the State Railroad Commission if the other provisions are allowed to stand. With a properly constituted commission at all times, this might do, but there is also talk of inserting another condition and that is that companies shall not increase rates over the figures in existence at present.

At a meeting of the Cuyahoga County delegation to the State Legislature Saturday, Charles A. Otis, president of the Cuyahoga Telephone Company, stated that he is opposed to the passage of the Elson bill or the enactment of any other law that does not contain restrictions that will protect the people. He said that his company and the United States Telephone Company, of which he is a director, are trying to serve the people as they should and that he desired to see no law made that would enable them to combine with other companies to the detriment of those who had been patrons of these companies. A member of the House of Representatives expressed the belief that the bill would be killed on Tuesday of this week and Mr. Otis said that he would welcome the killing.

Proposed Maryland Public Utility Legislation.

During the past week the public utility bill before the Maryland legislature was subjected to strong attack, largely on the grounds that economic conditions in the State of Maryland do not warrant State regulation of public utility corporations. Mr. George R. Gaither, one of the prominent lawyers of the City of Baltimore and a former candidate for Mayor, appeared before the Judiciary Committee as a representative of the Western Maryland Railway and other corporations, and severely arraigned the lack of judgment which seeks to saddle on the State of Maryland, a measure at once so expensive and, as he claimed, so unnecessary. The bill, he said, if enacted in its present shape will be injurious to the best interests of the State, as Maryland occupies a peculiar position economically when compared with other States, and there has been no real demand for a public utilities commission. One of the greatest troubles about reform in this country is, he said, that the remedy is often more expensive than the disease.

Mr. Bryan, the former Attorney-General of the State of Maryland, appeared before the committee in behalf of the Pullman Company and, after explaining that the Pullman Company should not be subject to the commission, said that as a private citizen and a lawyer, he took the ground that the commission's powers would be unconstitutional, because the legislature cannot delegate to an executive department legislative functions. He claimed that the commission's actions would be legislative because they would be rules for future action.

The situation appears to be that those who demand a public utilities act have permitted four different bills to be prepared, and is made more discordant by special bills that have been put in against the Consolidated Gas Electric Light and Power Company, with the result that the outlook for any legislation this year is unpromising. There is, first of all, the public utilities bill prepared by Attorney-General Strauss in response to the pledge in the Democratic platform. This bill is now in the Judiciary Committee of the House of Delegates, whence it will probably be reported early next week. Next is the Pairo bill, which the Republican leaders have drawn up. Conflicting as between themselves, both of these bills, in turn, conflict with a bill prepared by the Reform League and finally, George R. Gaither, counsel for the Electric Company, has prepared still another public utilities bill. A further complication is the appearance in the House of the Gas and Electric Repeal Bills which have diverted attention temporarily from the general public utilities question and also opened up the question of control through competition, which is foreign to the spirit of all the utilities bills. Moreover, the fight for utilities regulation is disorganized, and without leadership, while the public service corporations are united and have in their service some of the leading public men of the State.

Large Electrically-Operated Vertical-Lift Bridge.

Departing from the bascule draw type of bridge which has been adopted for practically all the recent structures spanning the Chicago River, the engineers' committee of the Sanitary District board has selected a bridge of the vertical lift type for the new Twelfth Street crossing. According to the preliminary plans, the floor of the bridge will be lifted between the shore towers a clear height of 135 feet above the water level. The hoisting mechanism will be motor operated. The vertical lift type of bridge was selected for the site because of the extreme width of the river at this point, 265 ft. The Twelfth Street bridge will be the second of its type to be erected in Chicago, the first one, at the Halsted Street crossing, having been put up 20 years ago, since which time, however, considerable advances have been made in construction and operation.

Electroplating with Powder.

At a recent meeting of the Society of Arts, at Sheffield, Sir Henry Trueman Wood, the secretary, read a paper entitled "An Improved Method of Electroplating," contributed by Mr. Augustus Rosenberg. By the method described use is made of the metal to be deposited, mixed in a powdered form, with an electropositive metal, such as magnesium, with the addition of an inert substance, such as chalk, to lessen the violence of the reaction, and keep the coating from being "burned on" and of a bad, unequal color. To his mixture of powdered materials Mr. Rosenberg has given the trade name of "Galvanit," and the deposition process involves in each case only a single operation, consisting in the application of a powder by means of a rag or brush and rubbing the object to be coated in the presence of moisture. No preliminary chemical treatment is required, such as dipping in caustic alkalies or pickling in strong acids. Provided the objects are reasonably clean and bright, they can be plated without such preliminary treatment; in the rubbing with a rag or brush concurrently with the deposition process there is brought about a cleansing and polishing of the surface of the newly produced metallic deposit.

The author gives the following description of his process: "The electropositive metal constitutes the anode and the object treated the cathode, and as "Galvanit" contains a quantity of finely powdered electropositive metal, it makes innumerable contacts with the cathode surface and acts as so many minute anodes. These innumerable minute anodes gradually dissolve, and in dissolving set up in the liquid little local circulations of electric current. The circuits are so excessively small, so exceedingly near together, and so numerous that they cannot be separately observed, and the surface of the metal becomes the seat of innumerable concomitant voltaic and electrolytic actions. Thus the potential or stored-up energy of the elementary substances in the powder is converted into electric current, and as these currents leave the liquid they throw down from the metallic salt in solution a thick film on the cathode, and it becomes plated over with a deposit."

Although a rise in temperature is not necessary to the successful use of "Galvanit," in some cases a quicker and thicker deposit of metal can be obtained with the aid of heat. The method of doing this and details of variations in the process necessary in dealing with aluminum and nickel were explained by Mr. Rosenberg, who finally showed that a "Galvanit" powder used as a household polishing agent would, instead of abrading the plated surface, actually increase its thickness. The new system will mean that the harder the servants rub the spoons, so much thicker will the silver on them become.

In discussing the paper, Prof. Sylvanus P. Thompson, who presided at the meeting, said that when Mr. Rosenberg brought the process to his notice and asked him to try it in his laboratory, he confessed that he was skeptical, and when Mr. Rosenberg dared to utter the word "nickel" he (the speaker) said it could not be done by that process; but experiments showed that it could be done, and that, with a very simple process of rubbing the powders on the metal, a real metallic film could be deposited.

New York City Central-Station Statistics.

Following are brief details of the equipment of the several power houses and substations of the New York Edison Company:

22 direct-current, low-tension dynamos, 135-270 volts	10,200 kw
129 rotary-converter and motor-generator sets, 270 volts	147,600 kw
11 alternating-current dynamos, engine driven, 6600 volts, 25 cycles	38,500 kw
11 alternating-current turbo-generators, 6600 volts, 25 cycles.	86,000 kw
4 alternating-current turbo-generators, 7500 volts, 60 cycles.	35,000 kw
Reciprocating engines	76,150 hp
Steam turbines	121,000 kw
Boilers	109,620 hp
Storage batteries (3-hr rate)	11,625 kw

The installation served by the company on Jan. 1, 1910, was as follows:

Incandescent lamps	3,590,887
Arc lamps	38,232
Heating appliances	1,218 kw
Storage batteries	5,435 kw
Motors	219,832 hp
16-cp equivalents	7,108,367

Following is the service supplied for city lighting: 5871 arcs, 450-watt, alternating-current series and multiple low-tension, direct-current, enclosed, $100 per lamp per year with sliding scale to minimum of $80 per lamp per year for a total of more than 15,000 lamps; 176 pairs of 450-watt arcs, $164.25 per pair yearly; 675 alternating-current series 60-cp tungsten lamps, company's equipment, $30 per year; 1996 multiple 60-cp tungsten lamps, city's equipment, $28 per year. Incandescent, arc and power service for public buildings is supplied at special city lighting meter rates of 7½ cents per kw-hour for lighting and 6 cents per kw-hour for power.

In the Borough of the Bronx the following service for street lighting is supplied: 1499 arcs, 2000 cp, $100 per year, with sliding scale to minimum of $80 per lamp per year for a total of more than 15,000 lamps; 612 incandescents, 25 cp, at $25 per year.

Change in Paris Electric Service.

Previous to the year 1907, during which there was formed a single company for distributing electrical energy in Paris, there existed six separate companies, each with its own generating station, for supplying electricity over a limited area. The company which now enjoys a monopoly has planned to con-

struct two 75,000-kw generating stations, one at St. Denis and the other at Issy-les-Moulineaux, several of the older stations being used as reserve.

Under the new arrangement there will be three areas of supply. The first includes the central district, with a dense population and a heavy demand for energy both for lamps and motors. Here the old method of distribution will be retained—direct current, with three or five wires. The second area extends over the left bank of the river and the fashionable districts of the west, where the population is comparatively sparse and the consumption not very heavy. Here also the old method has been retained—single-phase alternating current at 3000 volts. The third area includes the northeast, the east and the southeast, where formerly it might be said no supply was given at all. Here the population is not very dense and the consumption correspondingly slight, but it is thought that there are good prospects of development in regard to motor service, and the choice has fallen on two-phase current at 2 by 110 volts, which is equally convenient for purposes of lighting and motor service.

In the area where direct current is supplied this plan has entailed the adaptation or construction of 11 substations for transforming high-tension alternating current into low-tension direct current. These substations will ultimately be connected to the two large generating stations, but at present they are supplied from central stations belonging to the independent companies.

In the district where single-phase alternating current has been adopted four substations have been planned. In these the high tension is reduced to 3000 volts, and thence the energy is distributed to houses where the e.m.f. is again reduced. Two of these substations have still to be finished.

The district in which the supply is to be two-phase alternating has been provided with five main distributing centers, which are now nearly completed. From these the energy will be distributed to 120 transforming points, where the e.m.f. will be reduced to 2 by 110 volts, so that energy may be distributed in the street mains. Of these 120 points eight are ready, 10 are being constructed and 39 are to be begun immediately. The mains will include 270 miles of primary feeders conveying the energy from the main generating stations to the substations and chief distributing centers, and 21 miles of subways in which they will be laid, in places where it is necessary to concentrate them. Of the mains 215 miles have been laid, and 17 miles of subways are ready. Of the feeders for the street mains 72 miles are in place and 150 miles of the mains themselves have been laid. In addition 16.5 miles of mains with two wires have been converted to the three-wire or five-wire system. These figures give some idea of the activity with which the reorganization of the electricity supply has been pushed during the last two years. The expenditure has not been less than $16,000,000.

Regulation of Wireless Telegraphy.

At a meeting of the Wireless Institute, held in the Engineering Societies Building on March 2, Mr. Harold Veamans presented a paper entitled "Wireless Legislation and the Status of the Individual Operator." The author contended that laws passed by Congress relating to the regulation of wireless telegraphy could not be enforced in such a way as to affect the amateur operator who is not regularly engaged in transmitting messages from one State to another. Only local State laws can affect such an amateur, but the States can act upon suggestions made by Congress and pass laws in conformity to the wishes of Congress. Mr. Veamans expressed the opinion that the best results will be obtained by the appointment of a commission to deal with wireless communications having powers similar to the public service commissions.

In a written communication, Mr. G. W. Pickard endorsed the suggestion of the author and stated that much good can be accomplished by a suitable technical commission, especially in preventing interference with commercial messages by amateur operators.

Mr. R. H. Marriott remarked that when wireless communications are confined to over-sea messages the interference, which is attributable largely to over-land messages, will be properly minimized. He expressed his belief that over-land communications should be abandoned by wireless telegraphy in favor of wire telegraphy, which is much superior for this purpose, wireless telegraphy being limited to over-sea service, in which it is supreme.

Mr. A. N. Goldsmith claimed that the amateur operator should be encouraged rather than discouraged, although he should be properly instructed in the use of his apparatus so that he will not interfere with commercial messages.

Mr. L. R. Gleason outlined the regulations imposed upon amateur operators in England, and remarked that the restrictions are not considered burdensome. The operator is led to understand his moral obligation to the wireless industry and interference has been minimized.

Mr. F. W. Midgley explained at some length the methods that can be employed for eliminating interference, such as employing condenser ground connections rather than metallic connections and using short wave-lengths.

During the discussion it was stated that the so-called "tuning" methods have not been sufficiently well developed to insure non-interference. It was claimed, however, that much of the present-day trouble arising from interference is attributable less to the activities of amateur operators than to the studied attempts of certain of the operating companies to interrupt the continuity of messages being sent by its rivals.

The Electric Vehicle.

The regular monthly meeting of the Electric Vehicle and Central Station Association was held at the auditorium of the Edison Electric Illuminating Company, Boston, on February 28, with President Frank J. Stone in the chair. The evening was devoted to an address on the mercury-arc rectifier by Mr. H. M. Scheibe of the Westinghouse Electric & Manufacturing Company, Pittsburg, and a review of recent experiences with electric vehicles in the heavy snowstorms of the present winter. Mr. Scheibe described the latest forms of rectifier in a thorough manner by the aid of numerous lantern slides, and touched upon the relative value of different current transforming devices for battery charging. The fixed ratio of the rotary converter renders it inflexible; its hunting and starting difficulties, he said, also place it outside of the so-called "fool-proof" class of apparatus. With rotary commutators it is difficult to produce satisfactory and permanent commutation, and the spark gap rectifier is not yet a commercial piece of apparatus. The electrolytic rectifier is self-starting, simple in design, with no moving parts, but it has the disadvantages of very low efficiency, high maintenance and overheating troubles. The motor-generator is non-synchronous, easy to handle, but when operated by single-phase power a heavy and objectionable starting current is required. The efficiency in small sizes seldom exceeds 55 per cent.

On the other hand, the mercury-arc rectifier is convenient, clean and efficient. Its sole drawback is the cost of bulb renewals. An average life of 500 hours is now guaranteed by reputable makers. It is advantageous for the electric vehicle owner to have his own charging equipment. He escapes the careless overcharging of the gasoline garage; saves battery mileage to and from the commercial garage; and economizes in the cost of current and in the time needed for garage trips.

Replying to questions, Mr. Scheibe said that rectifiers are now made in commercial forms capable of handling 25 to 30 amperes and charging 44 cells. In attempts to operate rectifiers in parallel, the results are a little sensitive as yet. The general opinion of the meeting was that central stations cannot afford to install rectifiers free of investment expense to the vehicle owner. Rectifiers will run satisfactorily up to 250 volts alternating current service.

President Stone then conducted a series of discussions in the way of a symposium of experience with electric vehicles

in the recent blizzards, in New England and elsewhere. One company operating a Waverley delivery wagon ordinarily making 30 miles per day stated that in the worst storm of the season the vehicle did the work of three single teams and made 22 miles without a failure. The company has operated this vehicle four years and would not take $400 less than the purchase price for it to-day. In another case the electric trucks operated satisfactorily in the snow, but the company did not have good results with its tire chains, which were removed and good operation then followed. The current consumption was about double that on good roads. The National Shawmut Bank, Boston, reported the most complete success with its electric collection and delivery wagon in the storms. Another house reported a somewhat decreased radius of action but no tie-ups. A large user stated that the wagon responded admirably when the streets were almost impassable. In another instance the owner purposely ran his 3½-ton truck through drifts 2 feet high, about 6 in. of snow being on the streets, and entirely successful operation resulted. Newspaper electric delivery wagons met their train connections in the face of conditions which would have stalled horse-drawn teams.

A 5-ton storage battery truck used by the well-known house of Ginn & Company, Boston, made a first-class record in the blizzard. It rammed through a drift 4 ft. high in the company's yard in Cambridge, and then without tire chains made its regular rounds of the Boston docks. The current consumption ran up to from 150 to 250 amps and the progress was slow, but steady. The company ran it into the yard of the New England Confectionery Company near the South Station, before running the truck back to Cambridge, and gave it a small "boosting charge" to be on the safe side, but the management had no reason to fear that the truck would not be able to return to the factory. The house feels that the electric truck is far superior to horses and has disposed of all its horse-drawn equipment. A new delivery wagon will soon be put in service. The George W. Gale Lumber Company, Cambridge, reported noteworthy success with a motor-trailer equipment consisting of a traction carriage body equipped with battery and motor and a single pair of forward wheels which is attached to a load of lumber, the rear wheels coming in place of the usual front wheels of the lumber wagon. When the ordinary lumber wagon is loaded the front end is jacked up; the usual front wheels are removed and the tractor run underneath and attached in place much as a locomotive couples to its tender. The lumber wagon is then lowered, and the company has an outfit with three pairs of wheels, the usual rear wheels of the lumber wagon being retained in place. The rear wheels of the tractor come just underneath the seat of the lumber-wagon driver. With this equipment a vast amount of time is saved. In 12 days the company carried 261 tons of lumber 259 miles, regardless of the weather, and in stormy weather the daily mileage averaged 14.

Mr. H. C. Cushing cited the recent progress of electric vehicles in England, notably for suburban bank collections and deliveries, one house having a traveling electric "cage" wagon with tellers on board who cash checks, receive deposits, etc. The business of the bank adopting this plan has doubled within a few months, as it reaches the suburban merchants in most effective style. An amusing testimonial was read from an English undertaker who recently adopted an electric funeral car, run by storage battery power. This man testified that with electricity he could make 20 "hearse-miles" per day, carry the mourners as well as the chiefly interested party aboard, and bury 7 persons per diem where with horses he could bury only 4!

Mr. Day Baker, Boston, closed the meeting with some remarks upon the broad economic value of the electric vehicle, especially in relation to the growing scarcity of wheat in the United States. There are 25,000,000 horses in the country, and it is estimated that 3½ acres are required for raising grain, per horse. Seventy-five per cent of the horses are used in trucking. The replacement of these horses by electric trucks would release many thousands of square miles for the raising of grain for human consumption and help relieve the situation. Again, the explosion temperature of gasoline is steadily going down, and ere long the insurance interests will protest effectively against the operation and storage of gasoline trucks in buildings where the fire risk is noticeable. The constantly decreasing price of electricity is a further point of advantage in relation to the vehicle industry, no less than to the central station.

Decision by Massachusetts Supreme Court in Boston Elevated Manhole Explosion Case.

The Supreme Judicial Court of Massachusetts has handed down a decision in favor of the plaintiffs in the case of O'Donnell, Ford and Reid v. Boston Elevated Railway Company, the issue being the question of the company's negligence in connection with a manhole explosion at Pleasant Street and Shawmut Avenue, Boston, in 1906. The accident occurred in the rush hours, following a short circuit of a 2,000,000 cm feeder cable in the Tremont Street subway at a point several hundred feet north of the manhole in question. The evidence showed that a fire resulting from the short circuit had also affected two or three 500,000 cm cables which ran through the manhole, partly melting off the lead covering and insulation, although the cables in the manhole itself were intact and were not burned there or in the immediate vicinity. The company's electrician testified that the cables were all tested twice a week, and those in the subway once a week, and that at the latest test no evidence of trouble was found. The Court holds that the explosion might have been due to electric sparks communicated to inflammable gas in the manhole, and that these sparks came from or were brought by the cables that passed through the manhole, due to the effect of the fire and short circuit a few hundred feet north of the spot where the explosion occurred. The case is interesting on account of the attitude of the court, which, in spite of the paucity of technical evidence, holds the company responsible for trouble occurring at a distance from an underground short circuit. It emphasizes the importance of constantly maintaining the highest standards of construction and of cutting out of service feeder cables closely associated with others of their kind upon which trouble is concentrated.

Illinois Legislation.

Before adjourning on March 2 the Illinois Legislature, called in special session by Governor Deneen, passed the bill allowing cities in Illinois having less than 200,000 inhabitants to choose the commission form of government. Commissioners elected by the voters have all the powers of government, but may be recalled for misconduct. One of them will have supervision of public utilities and public-service corporations. It is optional with the cities whether they shall choose this form of government.

The Schmitt waterway bill, providing for a "deep waterway" from the terminus of the Chicago Drainage Canal on the Desplaines River at Lockport, Ill., to the head of navigation on the Illinois River at Utica, Ill., failed to pass. A feature of this plan was the development of water-power. Senator Ettelson's Chicago subway bill also failed to pass.

Massachusetts Commission Notes.

The Gardner Electric Light Company has petitioned the Gas and Electric Light Commission for authority to issue new securities to increase its capital stock from $65,000 to $170,000. The company desires to issue 200 shares of common stock and 850 shares of preferred stock, each at a par value of $100, for the purpose of paying a floating indebtedness of $64,000; reducing an outstanding mortgage of $13,000; retiring an underlying mortgage of $20,000 and providing $25,000 for enlarg-

ing the plant and distribution system. The company has recently begun to distribute power in its territory from the high-tension lines of the Connecticut River Transmission Company, and it is expected that the introduction of this hydroelectric service will require considerable improvement and extension in the system of power distribution in the town. A special effort is to be made to secure the business of the larger manufacturers.

The Massachusetts Gas & Electric Light Commission has received a petition from the Uxbridge & Northbridge Electric Company for authority to issue new capital stock to the amount of $168,100, to pay for plant additions and to liquidate floating indebtedness. A petition has also been received from the Great Barrington Electric Light Company for the right to issue new stock to the amount of $23,000, to pay floating indebtedness. The Boston Consolidated Gas Company, having received $568,833 from the sale of real estate, appears before the board to obtain authority to utilize these funds in its plant construction account.

The Massachusetts Railroad Commission has been petitioned by the Boston & Worcester Street Railway Company for authority to issue 20-year, 4½ per cent gold bonds to the amount of $360,000 above the company's present authorized bonding of $1,910,000, for the purpose of paying for various improvements in the property, redeeming bonds of the Framingham Union Street Railway Company and providing working capital. The Milford & Uxbridge Street Railway Company has also petitioned the board for the right to issue $88,000 worth of new preferred stock. The commission has issued a finding in the petition of citizens of Newton relative to service on the Commonwealth Avenue line of the Middlesex & Boston Street Railway Company. The board states that a study of the traffic between Center Street and Auburndale does not warrant the ordering of a 15-minute service, but that the company should institute additional service to and from the Brae-Burn Country Club upon occasions when winter sports, etc., are taking place. In the petition of citizens of Tewksbury and Wilmington relative to service on the Boston & Northern Street Railway, the board issues a memorandum stating that the company will furnish additional facilities.

Massachusetts Legislative Notes.

The committee on mercantile affairs gave a hearing on March 3 upon the various bills now before the Legislature in relation to telephone charges in eastern Massachusetts. Interest centered upon the appearance before the committee of Col. William D. Sohier, a member of the Massachusetts Highway Commission, which has the supervision of telephone and telegraph companies in the State. Colonel Sohier stated that the exhaustive investigation of the operating cost and traffic of the New England Telephone & Telegraph Company, which has been carried forward under the supervision of the consulting engineers of the board, Messrs. D. C. & W. B. Jackson, of Boston and Chicago, is nearly completed. The general effect of the report will be the lowering of telephone rates for small users in limited districts. The effort has been to reduce the maximum charge in a given territory to a rate which will be fair in relation to the company's revenue and equitable to the public. Counsel E. K. Hall, for the New England Telephone & Telegraph Company, stated that the bills requiring the company to institute certain arbitrary charges in specified districts illustrate dangerous legislation. The company is disposed to do all it can to meet the needs of its subscribers, so far as is consistent with a reasonable return upon its investment and a high standard of service. Mr. Hall pointed out that for the last 15 years the general trend of telephone rates has been downward. The total revenue of the New England company per telephone was $74.99 in 1895 compared with $32.47 in 1909. Several representatives of the Legislature also appeared before the committee, and considerable emphasis was laid upon the desirability of a reduction in the 10-cent toll charge between various Boston suburbs and the city proper. A powerful sentiment exists in favor of the reduction of this charge, at least to subscribers. Pending the report of the commission upon the completion of the work of its engineers the hearing was continued.

The committee on mercantile affairs has recommended that the bill relative to the installation of electric wires in cities and towns in connection with the petition of Clarence W. Starrett be referred to the Legislature of 1911 for consideration. The bill provided that before any person, firm or corporation should engage in the installation of wires and appliances for electric light, heat or power purposes within buildings in cities, permission to undertake such work must be obtained from duly authorized municipal officers in the form of a wiring license costing $10. The various bills relating to the electrification of steam railroads in the Boston metropolitan district have been transferred from the committee on railroads to the committee on metropolitan affairs. Four of these bills have been introduced into the House at the present session, and there is a strong sentiment growing in favor of requiring the railroad companies to make a positive movement this year toward the substitution of electricity for steam. The consideration of the subject by the committee on metropolitan affairs insures a study of the situation in connection with other transit matters at Boston, and before the end of the present session some interesting discussion of the electrification problem is to be expected. The committee on mercantile affairs has voted leave to withdraw the bill accompanying the petition of John P. Coghlin for legislation relative to the licensing of electricians by a State board of examiners and supervisors. The committee on railroads has voted leave to withdraw the bill providing for the election of members of the Railroad Commission by popular vote. The bill to limit the authority of a gas or electric light company to change its location has been given a second reading in the House. This bill provides that the Gas and Electric Light Commission may, after a public hearing, authorize a gas or electric light company to carry on the business for which it was incorporated in a city or town not named in its agreement of association or charter. The bill to extend the time for the removal of overhead wires in the city of Pittsfield has been ordered to a third reading in the House.

The committee on mercantile affairs has voted to withdraw the bill providing that any telephone subscriber who has paid for the use of an instrument for six months or more shall have the right to use the instrument to receive incoming calls, but not of sending outgoing calls, for six months thereafter, notwithstanding the non-payment of charges, without disconnection by the company. The committee has referred to the next Legislature the bill providing for a fine of $50 from whoever wilfully interrupts or wilfully breaks in and listens to a telephone conversation between others. The House has killed an attempt to set aside the adverse report of the committee on public lighting on the Monill bill to permit cities and towns to establish municipal lighting plants upon a single vote of the citizens, without the necessity of purchasing the plants of established companies. The majority against reconsidering this thoroughly pernicious bill was large, the vote being 70 to 33 against the municipal ownership scheme.

New York Public Service Commission News.

During the past week there have been several conferences between the Public Service Commissioners and the Rapid Transit Committee of the Board of Estimate and Apportionment regarding the subway projects. It is said that the plans for new rapid transit construction in New York City are being rapidly completed, and that possibly within 30 days demands for bids for the construction of the Tri-borough route will be published. The present plans contemplate making contracts to cover the entire route, so that work can be started at a number of points at the same time. At the last conference, March 7, the propositions of the Interborough Rapid Transit

Company were discussed. Before attending the conference, Mayor Gaynor had held a long consultation with President Shonts and the position of the company was discussed. It is generally understood that the Interborough is prepared to modify its propositions and may bid under the plans prepared by the commission.

The Public Service Commission of the First District is still hearing testimony with regard to the value of the Third Avenue Railroad Company's property, in connection with the proposed reorganization plan. Although the property has been purchased by the bondholders' reorganization committee, no attempt will be made to proceed with the work of reorganization until the commission has passed upon the application.

At the hearing before Commissioner Maltbie on the application of the New York Edison Company to issue $5,349,400 new stock, close inquiry was made as to the purpose of the issue. Assistant Treasurer Joseph Williams, of the company, said that the proceeds of the sale were to be used to retire outstanding bonds. The commissioner suggested that as the company had in its treasury about $3,000,000 in cash, it might be advisable to pay off the Mt. Morris Electric Light Company's bonds with part of this money instead of issuing new stock. The officials of the company declared that the cash in the treasury was needed for new construction. President George B. Cortelyou, of the Consolidated Gas Company, has been present at the hearings, but has not been called upon to testify. The Gas company owns practically all of the Edison company's stock.

The commission granted the Interborough Rapid Transit Company further time, until March 17, to put into effect the recent order for improvement of subway train service. The delay was granted because General Manager Hedley submitted a program for improvement which he believed was more practical than that outlined by the commission. The new plan will be tested during the postponement.

The Board of Estimate and Apportionment last week granted a franchise to the Manhattan Bridge Three-Cent Line to operate across the new bridge, through Canal Street, Manhattan, and through Flatbush Avenue in Brooklyn to the station of the Long Island Railroad Company. The Public Service Commission has not yet granted to this line a certificate of "necessity and convenience." It was the opinion of the company's attorneys that the franchise could be granted before the commission took action as well as after.

The Public Service Commission, Second District, will this week give hearings as follows: On the application of the Palmyra Gas & Electric Company, Newark Gas Light and Fuel Company, New Light & Power Company of Newark, and Lyons Gas Light Company and the Wayne County Electric Company for approval of the consolidation of these companies into the Wayne County Gas & Electric Company and for permission to execute a mortgage and issue bonds and stock; on the application of the Schenectady Railway Company for approval of an extension of its railway in the city of Schenectady along Edison Avenue; on the application of the Hoosac River Electric Light & Power Company for permission to exercise franchises in the village of Schaghticoke and for authority to issue $15,000 in common capital stock; on the application of the East Creek Electric Light & Power Company for authority to execute a mortgage upon all its property for $3,000,000 and to increase its capital stock from $200,000 to $750,000; on the application of the South Shore Gas Company for permission to exercise franchises in the town of Babylon and villages of Babylon, Farmingdale and Amityville for furnishing gas to these localities and for permission to issue common capital stock, a mortgage and mortgage bonds; on the petition of the Antwerp Light & Power Company and Joseph A. Baumert for permission to erect, maintain and operate in the village of Antwerp, Jefferson County, poles and wires for transmitting and furnishing to the public electricity for light, heat and power and for the exercise of a franchise to use the streets of said village, and for the consent of the commission to the transfer to the company from Joseph A. Baumert of works and system of an electric light, heat and power plant in said village and a contract between said Baumert and the village for lighting the streets of the village; on the application of the Niagara & Erie Power Company asking for the consent of the commission to the taking over of the local service of the Buffalo & Lake Erie Traction Company and the Niagara, Lockport & Ontario Power Company wherein municipalities and commercial customers are served and for authority to issue stock and bonds; also on the application of the Cliff Electrical Distributing Company for authority to issue $400,000 in 30-year 5 per cent bonds to be secured by a first mortgage for $1,500,000.

The Southern Dutchess Gas & Electric Company has been ordered to show cause why it should not improve its plant and methods of manufacture so as to distribute gas at Fishkill Landing in compliance with the requirements of the State's standard.

CURRENT NEWS AND NOTES.

Water-Power of Minnesota.—In an address before the St. Paul Traffic Club, on Feb. 17, Col. James H. Davidson, chairman of the Waterways Commission, stated that the rivers of Minnesota are capable of producing 1,000,000 hp, only one-fourth of which has been developed.

Meeting of New York Section, I. E. S.—The next meeting of the New York Section of the Illuminating Engineering Society, which has been scheduled to take place on March 10, as announced in these columns last week, has been postponed to March 17. The meeting will take place in assembly room No. 2, Engineering Societies' Building.

Regulation of Telephone and Telegraph Service.—A bill has been introduced in the New York Assembly providing an appropriation of $27,000, in addition to the original appropriation of $10,000, for payment of the expenses of the legislative committee investigating the question of extending the jurisdiction of the Public Service Commissions to telephone and telegraphs.

German Patent Law.—In a debate in the Reichstag on March 4 Herr Delbrueck, vice-chancellor, claimed that the American-German patent agreement is of a one-sided nature, saying that in the United States neither Germans nor Americans are compelled to work their patents, while in Germany Germans must submit to the compulsory clause, whereas Americans escape. Disagreeable consequences resulting from this state of affairs have arisen in several instances where American firms, domiciled in Germany and having patented articles there, had immediately transferred their patent rights to their American branch when threatened with compulsion. He promised the introduction of a new bill for remedying the defect in the patent agreement.

Letter-Telegrams.—Following the announcement of the Western Union Telegraph Company a special rate for "letter-telegrams," as outlined on page 457 of our issue for Feb. 24, the Postal Telegraph-Cable Company expressed its intention of inaugurating a similar service on the same date, namely, March 7. According to the plan of the Postal company, made public on March 6, night letter-telegrams will be accepted over the counter or by telephone in the usual way. The charge for 50 words or less will be the regular day rate for 10 words, and one-fifth of this rate will be charged for each additional 10 words or less. They must be written in plain English. Code or cipher will not be permitted. They will be accepted for transmission at night and delivery at destination on the morning of the next ensuing business day by mail or messenger, at the option of the company. The company coupled with its announcement a repetition of the statement recently made by President Clarence H. Mackay that it has always been independent and has no intention of entering into any combination with the Western Union and Bell Telephone companies.

Gas vs. Electric Meters.—During the month of February the Public Service Commission of New York City tested on complaint 720 gas meters, of which 57.9 were found to run fast and 5.7 slow, 36.4 per cent being correct within the legal limits. Of 98 electric meters tested on complant, 87.8 were correct, 8.1 slow and 4.1 fast.

1200-Volt Direct-Current Railway in Wisconsin.—It is announced that the 3300-volt, single-phase, alternating-current interurban railway of the Milwaukee Electric Railway & Light Company between Milwaukee and Watertown, Wis., will be changed over for 1200-volt, direct-current operation on March 15. This railway is about 50 miles long. The cars will be equipped with two 600-volt, direct-current motors in series. Electricity for operating them will be used at 600 volts in cities and villages and at 1200 volts in the country. There are two substations arranged for supplying electrical energy at 1200 volts, and the arrangement is such that the radius of line operation for the 1200 volts is about 10 miles.

Combined Dam and Power House.—In a lecture before the Civil Engineering Society of the Massachusetts Institute of Technology on March 2, Mr. H. L. Coburn, chief engineer of the Ambursen Hydraulic Construction Company, described an interesting hydroelectric installation now under construction on the Big Horn River, in Wyoming. The river being in a narrow canyon, there is no available site for the power house on either bank. The machinery will, therefore, be placed inside of the dam itself, with the draft tubes leading directly from the face of the dam to the turbines, thereby eliminating a large amount of losses in the head due to friction. A similar arrangement was described in our issue of Aug. 13, 1907, in an article entitled "Power Plant Inside of a Dam on the Patapsco River."

Proposed Electrification of Chicago Railroad Terminals.—Following up the policy previously decided on, the local transportation committee of the Chicago City Council has sent out a letter containing 150 questions to each of the 26 railroad companies having terminals in Chicago. These questions cover wide ground in the effort to seek definite information as to the smoke nuisance caused by steam locomotives, and measures which may be taken for its abatement. Two of the questions are as follows: "Have you had experience in the operation of gasoline or gasoline-electric motor cars, and to what extent? "Would their use in large numbers cause noxious odors, gases or substances which would be more objectionable than gases emitted from steam locomotives?"

Convention of Southwestern Electrical and Gas Association.—The date for the holding of the sixth annual convention of the Southwestern Electrical and Gas Association at Beaumont, Tex., has now been fixed for May 12, 13 and 14, 1910. The headquarters will be at the Crosby Hotel. Care has been taken to fix a date which, while close to that of the St. Louis convention of the National Electric Light Association, will not conflict with it, and it is expected that the Beaumont convention will be a successful one in every way. Mr. W. B. Head, of Stephensville, Tex., is president of the association, while Mr. Edward T. Moore and Mr. D. G. Fisher are, respectively, secretary and assistant secretary, at 300 Commerce Street, Dallas, Tex.

Activities of National Independent Telephone Association.—Some time in April, probably, the headquarters of the National Independent Telephone Association in Chicago will be moved from the present offices in the Monadnock Building to the new McCormick Building at the corner of Van Buren Street and Michigan Avenue. Here the association, which is the representative Independent telephone organization of the country, will have much larger offices in rooms 901, 902 and 903. With increased facilities, several new lines of work will be taken up, such as the organization of a publicity department, a map department and an information department. The last named will compile telephone data relating both to Bell and Independent companies, while the map department will prepare maps showing the Independent lines in the various States. The publicity department will have for its duty the keeping of the Independent telephone movement before the public. Mr. Frank H. Woods is the president of the association and Mr. J. B. Ware is secretary and treasurer.

Study of Wireless at Harvard.—Students at Harvard University have formed a wireless telegraph company with stations, general offices and all the features of an up-to-date commercial wireless company. The company has five stations in active operation run by students who are studying and experimenting with wireless communications. The principal scientific work of the company at present is the testing of interference-preventing devices designed to permit the simultaneous operation of several stations in the same vicinity without interference, and to eliminate the so-called "amateur interference" that is seriously hindering the naval and commercial stations. The effects of varying wave-lengths of stations and their power of radiation are also being studied with reference to the interference problem. The students claim that a large part of wireless interference can now be done away with by the use of improved instruments, and that the wireless companies will be compelled to equip their stations with apparatus of a like nature.

Electric Club of Chicago.—At the regular weekly meeting of the Electric Club of Chicago on March 2 Secretary Hickok announced the appointment of the speakers' committee as follows: Messrs. W. E. Keily (chairman), George H. Jones, E. H. Frank, John W. Mabbs, John G. Learned, Dana H. Howard, W. R. Pinckard and Otis B. Duncan. Mr. Frank L. Perry, of the reception committee, outlined a plan for making everybody acquainted at the meetings, in view of the fact that the membership of the club now embraces about 430 men. The proposal is that every member on entering attach to his coat a large badge with his name and that of his company conspicuously displayed. This suggestion will be acted on later. The speaker of the occasion was Mr. John M. Hubbard, assistant postmaster of the Chicago post-office, who greatly pleased the members present by an instructive and entertaining speech on "Postal Progress." Mr. Hubbard is also a fine vocalist and has a national reputation for his singing of the wartime song, "Old Shady." By request, he sang this song for the club at the conclusion of his speech, the audience joining in the chorus with enthusiasm and enjoyment.

Meeting of the A. P. S.—Among the papers presented at the New York meeting of the American Physical Society, held at the College of the City of New York on March 5, were five relating to electrophysics. "The Heat Liberated by the Absorption of Electrons by Metals," was the title of a paper by Messrs. O. W. Richardson and H. L. Coke. Papers entitled "Hydrodynamical Theory of an Electron in an Elastic Medium" and "Mechanical Model of an Electron" were read by Prof. J. G. Coffin. Miss Louise S. McDowell read a paper on "The Recovery of Selenium from X-Ray Excitation." Dr. E. F. Northrup exhibited and described a commercial type of ammeter for the precise measurement of alternating currents greater than 500 amp. This ammeter is of the mercury internal-pressure type and is provided with an arrangement for maintaining the liquid at a constant height independent of the accuracy with which it may be leveled. One of the most interesting features of the meeting was an experimental demonstration of vortex rings in fluids made by Dr. Northrup by means of an electromagnetic gun submerged in water. The rings shot from the gun consisted of masses of a red-colored alkaline solution which were caused to disappear slowly in the slightly acidulated water. The phenomena of reflection at the surface of a single liquid and change of composition when reflected through two liquids were shown in a thoroughly convincing manner.

ELECTRICITY IN A MODERN RESTAURANT.

Decorative and Utilitarian Application of Electricity in the Cafe de l'Opera, New York.

By T. I. JONES.

THE contribution electricity makes to the modern restaurant is illustrated in detail in the description which follows covering the electrical installation of the Café de l'Opera, located on Broadway, near Forty-second Street, New York City.

The café or restaurant occupies the entire building formerly devoted to the business of the Saranac Hotel, although little remains except the exterior walls of the old structure.

To describe the installation thoroughly and in detail a general survey of the interior architecture of the place must be made and then an account given of the parts of the building from the cellar up. The structure itself occupies a frontage on Broadway of 92 ft. running through 110 ft. deep to an equal frontage on the east side of Seventh Avenue, entrances being provided on both the Broadway and Seventh Avenue sides.

The exterior of the hotel has been little changed except by the addition of lattice work on the upper part of the window frames, ornamental ferns on the lower part of the windows, and electric lanterns and signs on the building front, there being at present six signs, all reading "Café de l'Opera." These signs are made up of 10-volt, 4-watt tungsten lamps operated from alternating-current mains through step-down transformers from a 220-volt service.

The interior of the building is arranged in the form of a grand court, shown in Fig. 1; the street, or grand, floor being shown in the lower part of the engraving, the opera, or first balcony, floor in the center, and the wistaria or Japanese room, the second balcony at the top. The basement of the building contains the grill room, ladies' and gentlemen's retiring rooms, manicure and barber shops, lavatories, ice-making machinery and electric service supply main transformer of meter equipment.

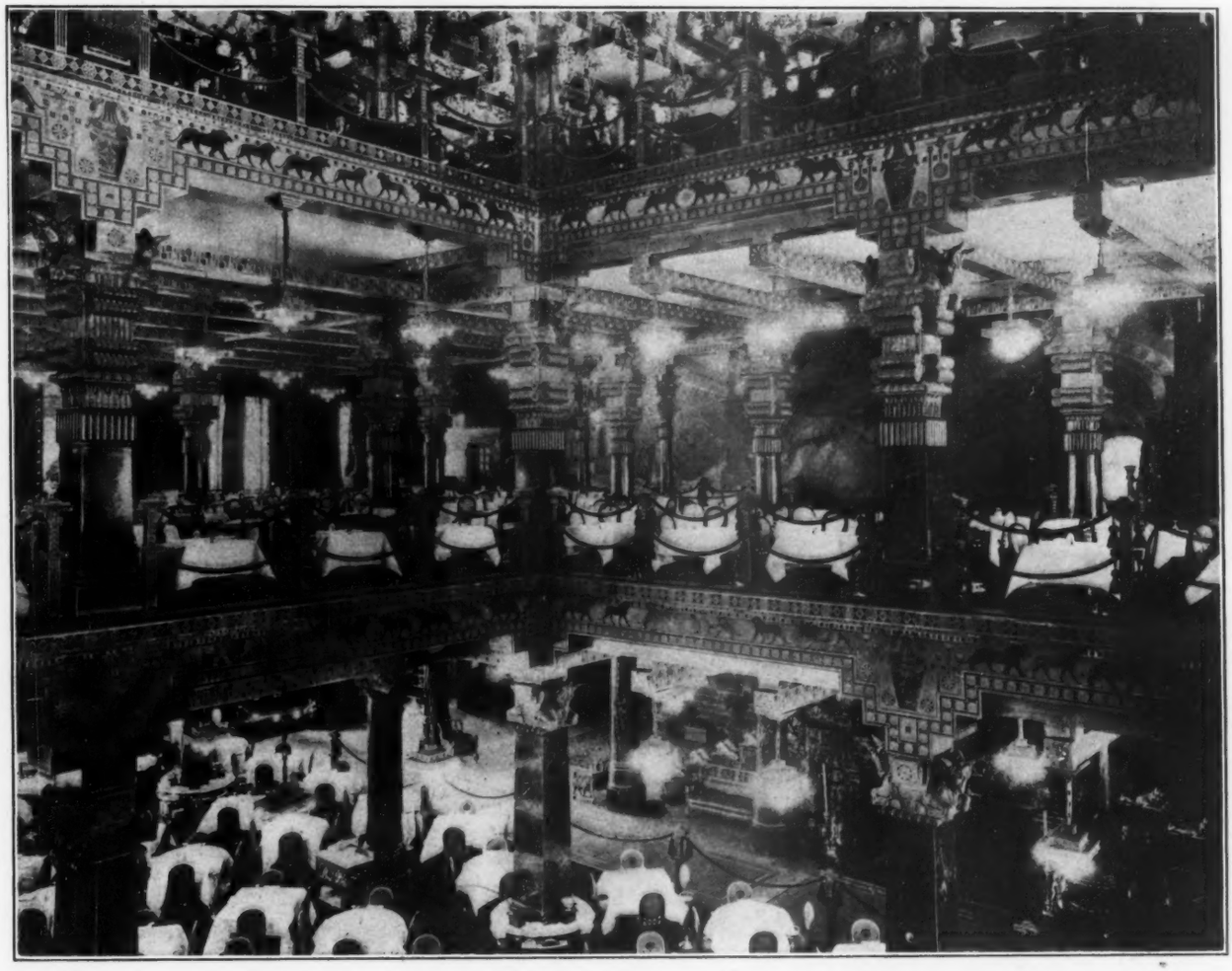


Fig. 1—View of Grand Court.

SERVICE AND SWITCHING APPARATUS.

The entire electrical equipment of the building is supplied from the alternating-current mains of The United Electric Light & Power Company, 60-cycle single-phase for the lighting and polyphase for the elevator and miscellaneous motor equipment. The electrical wiring was installed by the J. F. Hughes Company, of New York. The architectural work was by Henry C. Pelton, and the decorative designs by Henry Erkins.

The primary switches from which the service mains lead to the transformers are shown in Fig. 2. These transformers are 12 in number, being 50-kw units, eight connected for single-phase lighting service and four for the polyphase motor circuits. The transformers step-down from 3000 volts to 110-220 volts, the normal three-wire voltage of the building.

Fig. 3 shows the arrangement of the metering equipment measuring the energy on the secondary side of the transformers. This equipment consists of 16 Westinghouse induction meters, the single-phase meters for the lighting equipment being of 300-amp capacity and the polyphase meters measuring the energy consumed by the power applications, 40-kw meters. "P-M" meter connection blocks are used in the installation, as the engraving indicates, the meters being encased within this device, thus placing all the terminals under seal. The meters are fused within this connection box, and a test of any meter may be readily made, or the meter removed or changed without inter-

ruption to the supply on the feeder controlled by the meter. From these meters the mains run to the main switchboard, shown in Fig. 4. This switchboard is of the enamel-slate flush type, carrying 18 switches from which circuits are run to subpanels on the various floors. The position of the attendant, shown in Fig. 4, is on the main side of the board; with double-

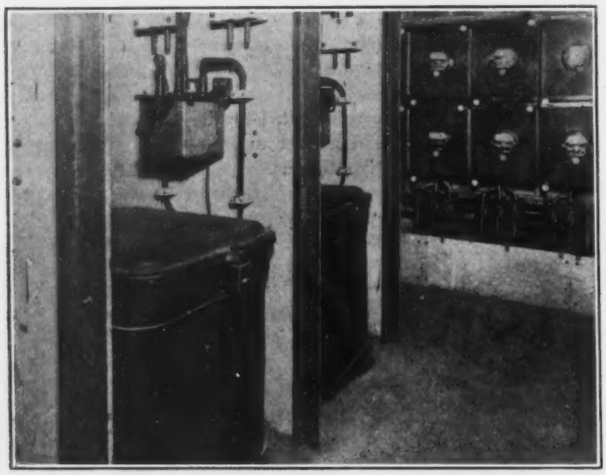


Fig. 2—Primary Service and Transformers. Partial View of Meter Boxes.

pole switches at his back controlling the ground floor and balcony service.

MOTORS AND APPLIANCES.

In the basement, besides the service entrance and switchboard equipment, there are: Two 7½-hp blower fans; two 10-hp exhaust fans; one 3-hp cold-air fan, to get a pressure of cold air in the wine room; one 3-hp humidifier, an apparatus for throwing a jet of water against a sheet to keep a certain amount of humidity in the main dining-room; one 7-hp vacuum cleaner, connected to a suction system with outlets on the various floors of the building; one 1-hp carbonator; one 2-hp motor, for agitating the water in the fountain; one 2-hp machine, for cubing ice; one 2-hp machine, for crushing ice; one ½-hp sump pump, and one ½-hp air-pressure motor. In

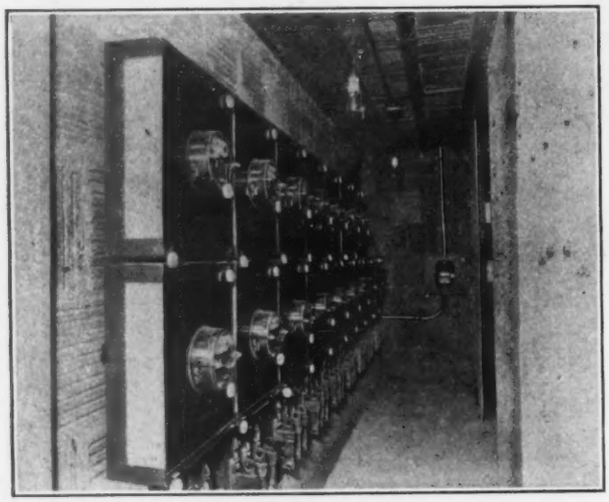


Fig. 3—Meter Room.

addition to these motors there is also in the basement the elevator machinery. There are four elevators at present in service, with one sidewalk lift, the elevators being of the Otis alternating-current, magnet-control type, capable of a speed of 150 ft. per minute, with a lifting capacity of 2000 lb. each. Each elevator has a 20-hp, two-phase motor, and the sidewalk lift has a 7½-hp, two-phase motor. Within the barber shop are located the usual electric appurtenances of electric massage machines, electric curling irons, etc.

ILLUMINATION.

The grand floor, shown in Fig. 5, a corner of which is also shown in Fig. 7, contains a beautiful display of incandescent electric lighting. The fixtures are, as shown, of inverted plate form, finished in gold; each fixture containing nine 50-watt, frosted lamps. The entire body of the ground floor is finished in black and dark blue with gold and blue relief; the beam effect of the ceiling containing gold, black and blue checks. Above each beam, hidden from view, are placed strips of tungsten Linolite lamps with artistically colored glass globes, the light from which is reflected upon the ceiling of the room, which is finished in sky blue.

On the southeast corner of this floor is located the throne, shown in Fig. 6; this court is lighted by a jet sphere, enclosing 10 50-watt Gem lamps, with two similar spheres containing four 50-watt Gem lamps each. The service through this floor is supplied from a sub-switchboard, containing 300 double-pole switches, some of which control the first balcony, shown in the grand court of Fig. 1. This first balcony is lighted in a similar manner to the street floor by 9-lamp pendant fixtures, containing 50-watt frosted spherical carbon lamps. Like the main floor

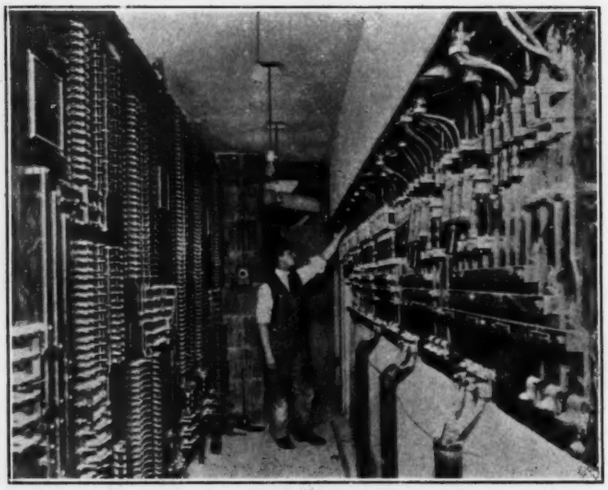


Fig. 4—View of Main Switchboard. Also of Ground and Principal Floor Panels.

ceiling the balcony ceiling is also lighted by reflection from tungsten Linolite lamps with colored globes.

The staircase, running from the street floor to the Japanese room, on the third floor, contains ornamental lighting fixtures in the shape of miniature-base, candelabra-type, frosted-carbon lamps, the lamp sockets being embedded in the back of bronzed lions, on each second step of the staircase.

On the north wall of the grand court, extending from the ground floor to the third floor, directly over the main stairway, is a beautiful oil painting representing the fall of Babylon, depicting the entrance of the troops upon Belshazzar's feast. This painting is illuminated by tungsten Linolite lamps in reflectors. On the western part of the same wall, on the balcony, is shown another oil painting illuminated by tungsten lamps in reflectors.

The second balcony or the third floor, or Japanese temple, as it is called, is lighted through two sub-switchboard panels, containing 110 double-pole switches. This room is shown in Fig. 6, the illumination of which differs materially from that of the other floors. As is shown in the engraving, lantern effects are used throughout, together with concealed lamps for the beams and wall. The lanterns contain frosted colored glass and each is lighted by 50-watt, Gem lamps, the ceiling reflectors containing the tungsten Linolite lamps used on the

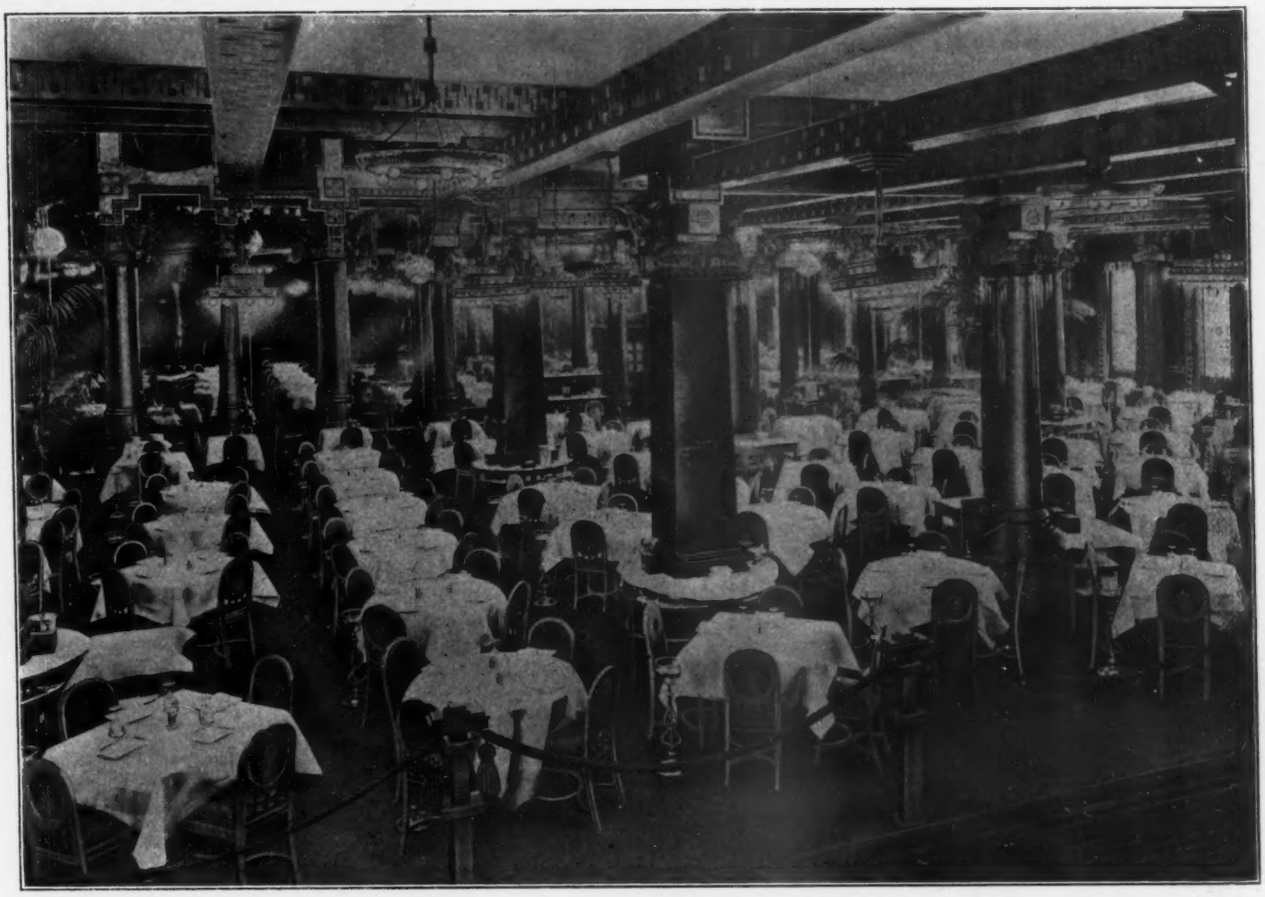


Fig. 5—View of Portion of Grand or Street Floor.

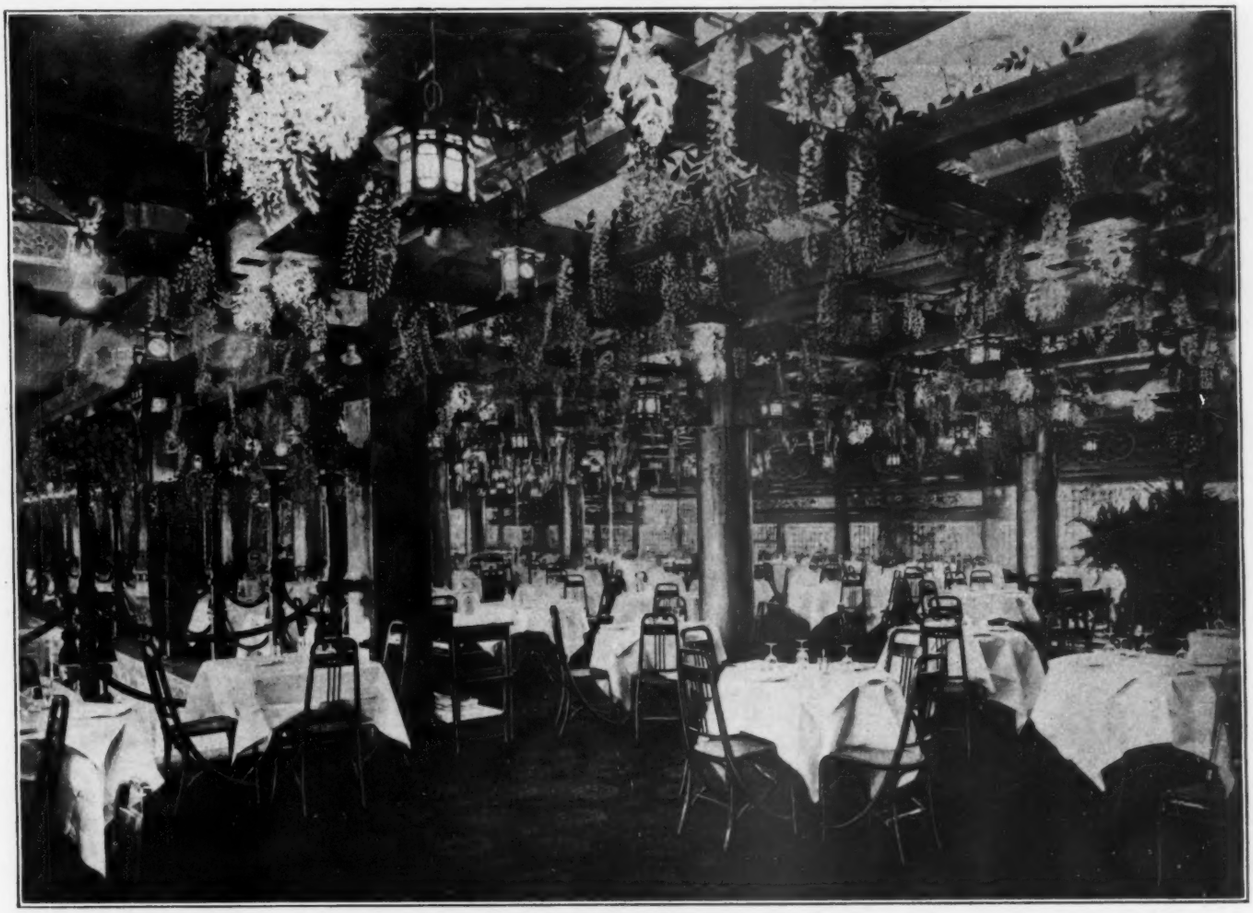


Fig. 6—Second Balcony or Japanese Room.

other floors with the exception that the tubes of the Linolite lamps on this floor are of clear glass rather than colored.

KITCHEN AND PANTRY APPLIANCES.

Above the Japanese room is located the kitchen and here an interesting electrical display is found. The pantry itself is really a part of another building, built south of the old Saranac Hotel and connecting through to the third floor by a passage-way. Within the pantry building, in direct connection with the kitchen, is the following electrical apparatus: One 24-circuit, double-pole switch panel; one 1-hp coffee grinder; one 3-hp blower fan, for ventilating kitchen; two 3-hp blower fans, for heating system; one 1½-hp motor, with humidifier; two 1-hp dish-washers; one ½-hp egg-beater; two ½-hp knife-grinders; one 2½-hp buffer motor, for polishing silver (Fig. 8); one 2-hp meat-chopper, and one 3-hp ice-cream freezer. In connection with the pantry building there are the following lifts for servant's use: Three 5-hp escalators; one 20-hp elevator,

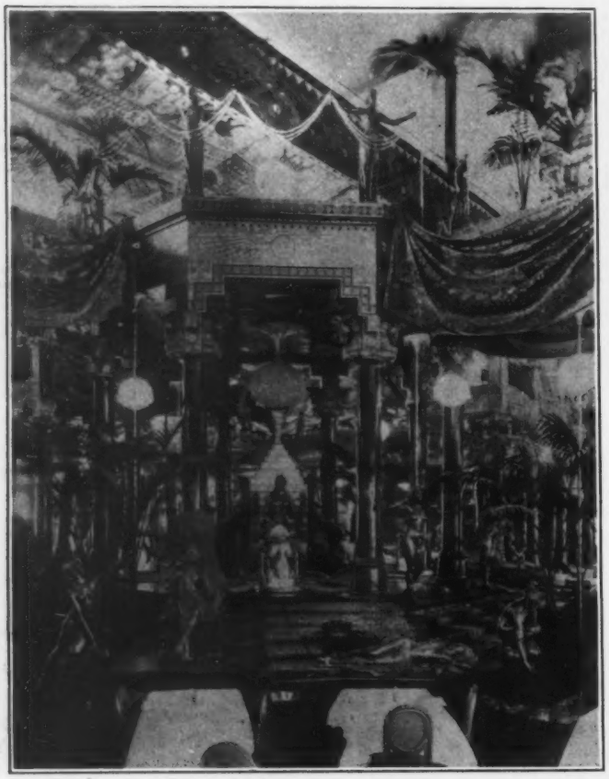


Fig. 7—View of Throne.

and two 7½-hp conveyors or dumb-waiters (one view of the dumb-waiter being shown in Fig. 9). Within the pantry building, on the lower floor, is a 7½-hp sidewalk lift.

Above the kitchen is located the Greek or banquet-room, containing a beautiful display of chandelier lighting also outlets for heating purposes, plate warmers, etc., used in connection with banquets. This room contains a balcony above which are the art room and storerooms, top floor containing quarters and offices of the restaurant.

TELEPHONE SYSTEM.

A complete local telephone exchange is installed, connecting all departments as well as public portions of the building. On the northwest corner of the ground floor are located the public telephone booths, which are built of black marble to match the decorations of that floor. Extensions, portable sets, etc., are freely provided so that telephone access may be had by a customer in any part of the building.

WAITER CONTROL SYSTEM.

A novel waiter system is installed, consisting of a 5-lamp return call indicator at each captain's station or service table, with separate lamp-indicating boards at conveyors on each main dining-room floor, connected with a main 230-lamp indicating board in kitchen, and used in connection with a pneumatic tube service. By this system written orders are transmitted to the kitchen and supply department. The scheme is as follows: The waiter takes the customers' order, writing each course on a separate slip and different colored sheet and

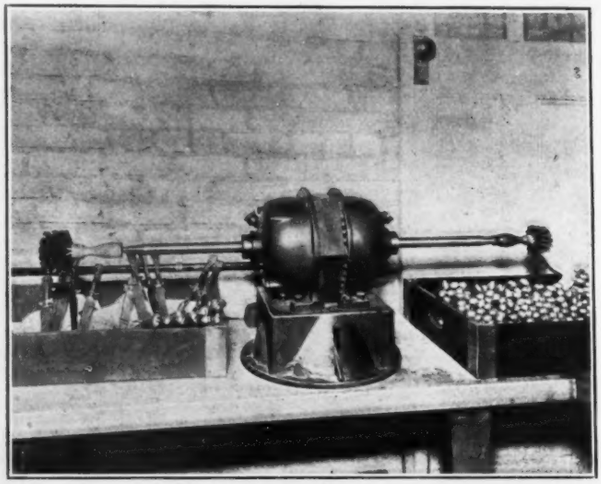


Fig. 8—Electrical Buffer.

these orders are then sent through the pneumatic tube to the kitchen and supply department. When the waiter is ready to have each course served he presses the button on his indicator corresponding to the number of table. This places the lamp at corresponding number in kitchen in circuit and when this portion of the order is delivered to the conveyor man, the latter pushes a button which lights the corresponding lamp on the waiter's indicator. The waiter then goes to the conveyor, gets his portion, pushes the button and extinguishes the lights, leaving the signal system ready for the next course.

THE DEVELOPMENT OF ALTERNATING CURRENT.

It is of interest to note, however, that this entire installation is supplied with alternating current—a notable example of the progress made in the development of this system for motors as well as for lighting.

The change in voltage with alternating current through the

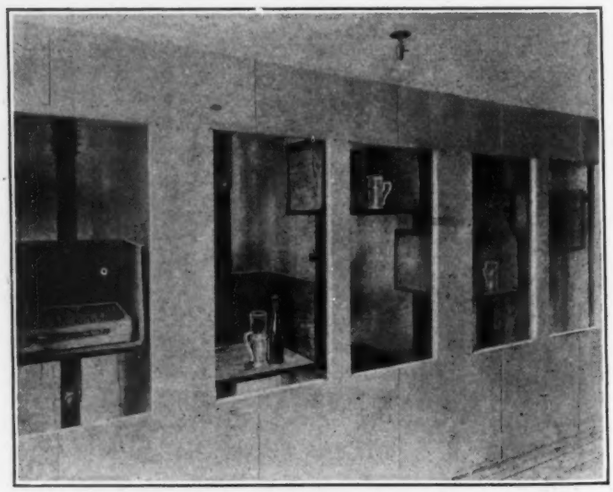


Fig. 9—Dumb Waiters Operated by Electric Motors.

use of transformers makes possible the use of low-voltage without series wiring, contributing in no small degree to the decorative effects through miniature lamps of low voltage. The application of alternating current to the propulsion of elevators of the magnet-control type indicates the progress made with this system along elevator lines; and the application

of alternating current to the buffing motors indicates advance made in variable-speed motors of alternating-current types. The complete installation comprises some 7000 50-watt equivalents, including the motor installation representing the equivalent of 3000 50-watt lamps.

From the above necessarily brief description it will be seen that electricity in a modern restaurant plays a most important part. The beauty of the electric illumination attracts the guest and the efficiency of the electric heating, motor and signaling applications contribute to the perfection of the service.

A BRITISH ELECTRICALLY-EQUIPPED TEXTILE MILL.

By JAMES L. DORAN.

THERE has been a considerable amount of correspondence and controversy recently in regard to the electrical operation of textile mills. Many mechanical engineers are evidently of the opinion that the electrical operation of such works has not demonstrated its utility and that it has not been proved that electrical operation is in any way superior to the ordinary means of transmission by ropes and belts. Despite this opinion, however, both expressed and inferred, it is instructive to note that during the last five years electrical driving to the extent of some 50,000 hp in alternating-current induction motors has been installed in the United Kingdom, and that to date there is approximately 300,000 hp of motors installed in similar mills in the United States alone. The Continent also is responsible for the installation of motors to a considerable extent. These facts furnish conclusive evidence of the remarkable progress electrical driving has made since its introduction. It is also instructive and significant that of the 50,000 hp in operation in the United Kingdom approximately 20,000 hp are driven by energy supplied from outside sources.

One of the latest electrical installations to be set to work in the United Kingdom is the Brunswick Mill of the Bannerman Mills Company, Ltd., Bradford Road, Manchester. This mill is

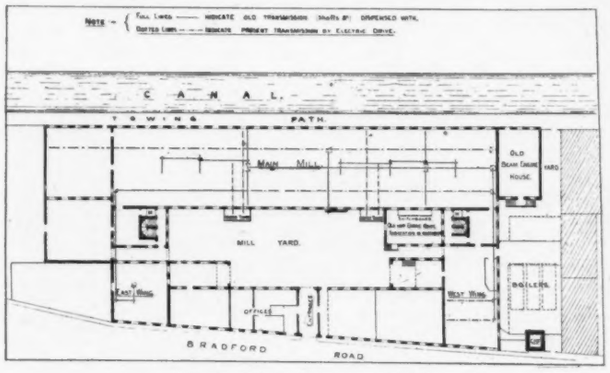


Fig. 1—General Plan of Mill.

one of a very old-established concern and has been run for many years in the ordinary way, having been driven from steam engines and the power transmitted to the various mill rooms by means of belt, rope and gear drive. The mill has for several generations been continuously and successfully driven in this manner, and it required, on the part of the mill authorities, considerable confidence in the reliability and commercial economy of electrical transmission to depart from their time-honored method of driving. However, after exhaustive investigations had been made it was decided to place the continuity of the running of the mill in the hands of an outside source of energy, namely, the electricity department of the city of Manchester.

The installation, now completed, has amply justified the confidence shown in the electricity department and the arrangement between the two parties may be cited as an example of the enormous influence a centralized electric energy supply system may exert in the industrial development of a district.

The installation, carried out by the British Thomson-Houston Company, Ltd., of Rugby, under the general supervision of the city electrical engineer, Mr. S. L. Pearce, is one of the largest single mill equipments at present working electrically in the United Kingdom.

The mill contains both mule and ring-spinning spindles, and on the Federation basis is rated as equal to 100,000 mule spindles. The whole of this machinery was originally driven by means of two steam engines—a two-crank beam engine and a single-crank horizontal engine with a combined rating of 1600 hp. For transmitting the power from these engines to the various rooms in the mill spur and beveled gears and upright shafts from the large beam engine were adopted, and rope driving with beveled gears from the small horizontal engine. By adopting the electrical drive, practically all of these gears and upright shafts were dispensed with, and to-day there remain in the mill only two small pairs of bevel gears, one at the foot and the other at the top of an upright shaft, which, for purely local reasons have been allowed to remain for driving a small amount of light machinery in the east wing of the mill.

The mill machinery to-day is driven throughout by means of three-phase induction motors receiving energy from a 400-volt supply system at a frequency of 50 cycles per second. The en-

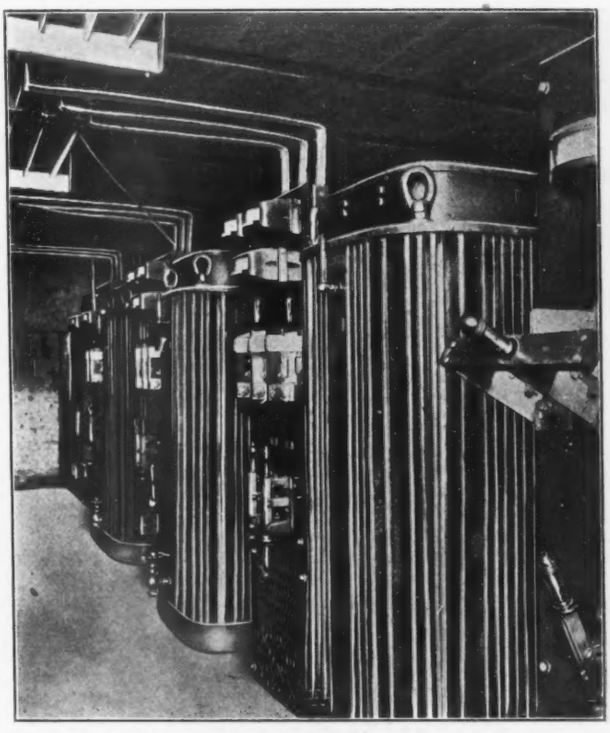


Fig. 2—Substation Apparatus.

ergy for driving the mill is supplied from the corporation mains at 6500 volts, a duplicate set of mains being extended to a substation arranged in the basement of the original small-engine house. The e.m.f. is there transformed from 6500 volts to a working pressure of 400 volts for the motors and to 220 volts for lighting purposes. The mill contains in all 37 motors aggregating 1640 hp.

Fig. 1 shows a general plan of the mill and indicates the position of the two engines originally used for driving, together with the methods in use up to the time of the installation of the electrical drive for transmitting the energy from these engines to the various main rooms. It will be noted that the problem of converting the mill from the mechanical to the electrical drive presented some unusual features, probably unique, and it is interesting to record that the methods adopted have proved very satisfactory to all concerned.

In describing the methods adopted for driving it is proposed to commence at the point at which the raw cotton is received in the mill and follow it through the various manufacturing

processes until it is ready for despatch as the finished product.

The bale hoist is situated in the west wing, and for driving this hoist a small motor is installed inverted on the ceiling of the blowing-room and driving by belt on to the hoist shaft. There is, therefore, no energy consumption at this point except at those times when the hoist is actually working.

For driving the bale-breaking, mixed lattices and blowing-room machinery a special 45-hp motor is installed in the blowing-room directly connected by flexible coupling to the lineshaft, from which the blowing-room machinery is driven. This lineshaft now runs at 480 r.p.m., the speed having been increased from its original value and the lineshaft pulleys altered accordingly. The lineshaft driving the bale-breaking and mixing-room is driven from this shaft by belt. The motor is of the slip-ring type and is started by means of a rheostat mounted on a panel erected close to the motor.

The machinery in the main cardroom, which is situated on the first floor of the main mill, and contains 112 cards and 16 preparation frames, is driven by a 150-hp slip-ring motor directly connected to the main card lineshaft, which is running at 290 r.p.m., a flexible coupling being installed between the motor and the lineshaft. In this room there were originally three main lines of shafting. By the installation of electrical driving one of these lines was dispensed with, and two rows of cards driven from one shaft placed between the two rows, the remaining lineshaft being driven from this by ropes. The

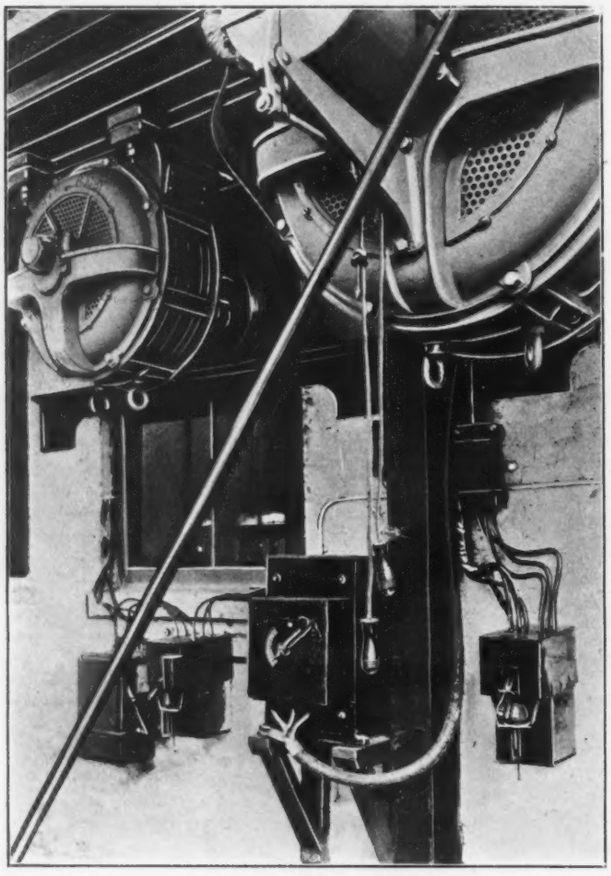


Fig. 3—Motors in Tower.

starting apparatus for this motor is a rheostat mounted on a suitable panel placed close to the motor.

The speed frame room, containing 64 drawing, slubbing, intermediate and roving frames, is situated on the second floor of the main mill. The machinery in this room is driven by means of a 130-hp slip-ring motor, directly connected to the main lineshaft by a flexible coupling, running at 485 r.p.m., the installation being generally similar to that in the cardroom mentioned previously. In both these cases, since the rooms contain preparation machinery and the atmosphere is often charged with cotton dust, it has been found advisable to cover each of the motors with a sheet-iron case connected by shallow air ducts with the outside atmosphere, a small electrically driven fan being installed for drawing air from the outside of the mill on the one side, through the motor and out again to the other side of the mill.

The machinery in each of two small roving-rooms, one in each of the two wings, is driven by one 18-hp squirrel-cage

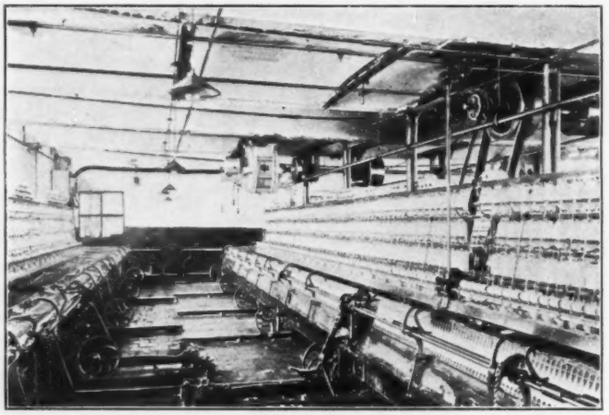


Fig. 4—Motor-Driven Mules.

motor, directly connected by a flexible coupling to the lineshaft running at 475 r.p.m.; each of these motors is started by an oil-immersed "star-delta" starting switch, situated close to the motor.

The operation of the machines on the ground floor and the third, fourth, fifth and sixth floors in the main mill, each containing four pairs of mules and 10 ring frames, presented one of the most difficult problems for solution, and the method adopted for driving the machinery is undoubtedly one of the most interesting features in the entire installation. The posi-

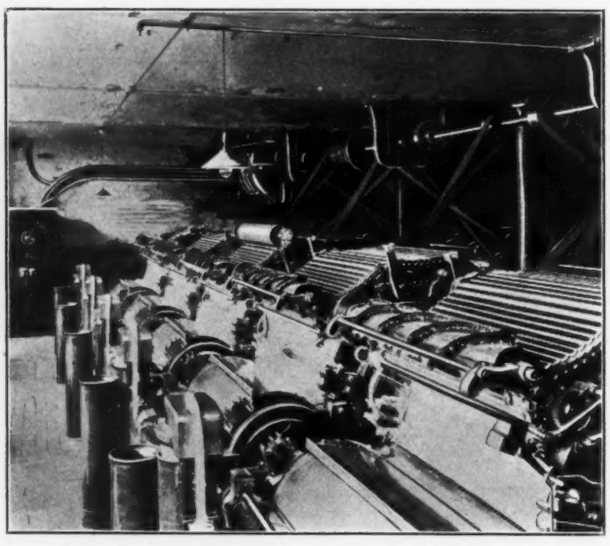


Fig. 5—Motor-Driven Card-Room Machinery.

tions of the machines in the various flats rendered it practically impossible to group more than two pairs of mules on each motor. This condition in itself was a somewhat difficult requirement, inasmuch as the load on this particular class of machine varies to a considerable degree, the maximum demand being at the very least twice the minimum and the cycle of operations being comparatively rapid. A further serious consideration affecting the method of procedure to be adopted was the necessity for such an arrangement as would enable

the mill to continue its ordinary working during the change-over period. The method adopted to drive the machines in these flats was to build two motor towers, one at each end of the mill on that side of the mill nearest the courtyard. The towers, which are independent of the main mill structure, are built entirely of steel framing and glazed casing, no brickwork being used. In each of these towers two motors per floor are installed for driving the machinery in each spinning-room, there being in all 10 motors per tower. Each of the motors for driving the mules is of the slip-ring type rated at 75 hp, running at 485 r.p.m., and coupled directly to the mule lineshaft by means of a flexible coupling. Each of these lineshafts runs the full width of the mill and drives by belt the four countershafts for the mules, special pulleys being provided on the lineshafts to suit the increased speed.

The 10 ring frames, which are situated in the two lines along the middle of each spinning-room, are divided into groups of four and six, and, owing to the fact that it was necessary to make arrangements so that the mill authorities could conveniently alter the speed of these frames to suit the various counts to be produced, a novel and ingenious system of rope transmission, which provides for three changes of speed at the spinning frame, was adopted.

The six frames on each floor at the western end of the mill are driven from a lineshaft carried half-way across the room and running at 725 r.p.m., a squirrel-cage type motor of 45-hp rating being connected to the lineshaft by means of a flexible coupling. Rope pulleys of special design to provide the three changes of speed required are installed on the lineshaft, the frames being driven by ropes over adjustable gallows pulleys.

The four ring frames on each floor at the eastern end of the mill are driven in a similar manner from a lineshaft running at 725 r.p.m., directly coupled to a 30-hp squirrel-cage type motor, the machinery on the five floors being driven in this manner.

The starting apparatus for each of the motors in the two towers is arranged in the towers on the same floor as the motor, and a special arrangement of emergency push buttons is fitted in each room, so that in case of necessity any motor may be stopped from the inside of the mill.

The winding and beaming machines situated on various floors of the east wing are driven by means of an 18-hp squirrel-cage type motor, driving by belt on to a lineshaft, the torque being transmitted to the various floors by means of a light upright shaft and two pairs of beveled gears.

Each of the hoists throughout the mill is driven by a separate motor, as is also the machinery in the mechanics' shop.

Advantage has been taken of the alterations carried out to equip the mill throughout with sprinkler apparatus, the sprinkler tank being arranged on the top of the eastern motor tower. The supply of water to this tank is by means of an electrically-driven high-lift turbine pump, provided with special starting apparatus, which automatically starts the motor in order to keep the tank filled when any of the sprinklers in the mill are in operation. The pump continues to run and supply water until it is stopped by hand.

An additional special feature of the installation is the main mill switchboard for distributing energy to the various motors. This board is arranged on the first floor of the original small-engine house, being therefore situated directly over the corporation sub-station. There are on this board 10 main motor-feeder circuits (one incoming feeder circuit, and one main lighting circuit. Each of the motor feeder circuits is fitted with a triple-pole, oil-switch having automatic overload cutouts, and each circuit is provided with a polyphase indicating wattmeter and a polyphase watt-hour meter. These instruments enable the mill authorities to read at any moment the exact amount of power being consumed on each circuit, and also to ascertain periodically the amount of energy consumed during any period. The information obtained in this manner by the authorities has proved of distinct service to them, forming, as it does, a complete check on the operation of each department.

The distributing mains and branch cables between the mill switchboard and the various motors are of the three-core steel-tape armored type throughout, fixed to the mill walls and ceilings. Where more than one motor is fed with energy from the same circuit, enclosed distributing fuse boxes are installed, each of the three-phase leads being in a separate box. The whole of the distributing boxes for the main mill motors are erected on a steel framework on the first floor level of the western motor tower, from which separate cables are run to each motor. The distributing boxes for the two wings of the mill are erected on the landings by the staircases.

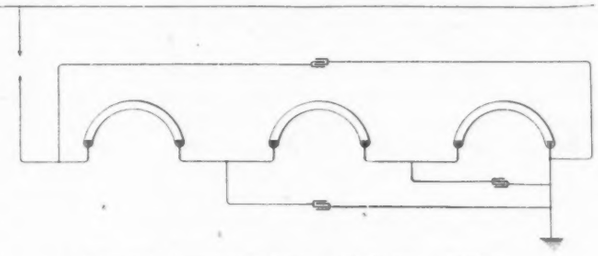
The mill is lighted by about 1000 carbon-filament 220-volt lamps, a separate three-phase lighting transformer being installed to provide the energy for lighting, the mill circuits being arranged so as to preserve the balance of load among the phases. The wiring throughout is carried in heavy gauge steel screwed tubing, fixed to the mill walls and ceilings, the whole being in strict accordance with most recent practice and requirements of the fire underwriters.

As a result of the experience to date, the mill officers are able to make a definite statement that they are obtaining from the same machinery a larger production, and they are of the opinion that the more regular speed obtained gives an improved quality of yarn. This statement, coupled with the fact that the manufactures of this company have always been of the highest grade, is eloquent testimony to the advantages which accrue from the application of electrical motors to the textile industry.

MERCURY-VAPOR LIGHTNING ARRESTER.

The mercury-vapor tube has added another important utility to its varied functions as lamp, rectifier, interrupter and circuit-breaker, according to the claims of a patent recently granted to Mr. Percy H. Thomas.

An arrangement of mercury-vapor vacuum tubes to serve as a lightning discharge path is shown in the circuit sketch herewith. In this case the arrester group is connected to the line through an adjustable spark-gap, and the mercury-vapor tubes are successively shunted by condenser paths. While the mercury-vapor vacuum device is not fitted by its characteristics to allow its discharge point to be accurately set for some predetermined rise in voltage, the tube has certain special properties which are of importance in suppressing the flow of a current from earth to ground. It is this latter function of which use is made in the arrester, the discharge point being determined by the spark-gap setting.



Thomas Mercury Vapor Lightning Arrester.

The operation of the circuit shown is as follows: Subsequent to the disruption of the spark-gap at high voltage an abnormal charge is impressed between the terminal of the condenser connected across the line and upon the adjacent vapor tube. The condenser circuit can absorb only a limited portion of this quantity, so that if the discharge is sufficient in amount the adjacent vapor tube is broken down and conditions similar to the above are impressed on the next discharge circuits. Thus, in succession, all of the vapor devices will be discharged, thereby providing a direct path to ground. After the abnormal flow has ceased, the vapor tubes will re-establish their characteristic high resistance, thereby suppressing any tendency for a flow of the line current to ground.

LARGE ARTIFICIALLY-COOLED TRANSFORMERS.

By Edwin R. Pearson.

THE growth of the transformer business and the continuous development of the apparatus to date has been as remarkable as that in any branch of the electrical industry.

In the present article will be given a brief and general description of some of the recent developments and steps leading up to them, in the design and manufacture of large artificially cooled transformers.

About 20 years ago the largest transformer had a rating in the vicinity of 10 kw, and reduced the e.m.f. from approximately 1000 volts or 2000 volts down to 50 volts or 100 volts for operating incandescent lamps. They were encased in iron boxes, without oil, and their temperatures depended only upon natural radiation. This arrangement was satisfactory in those days, when only small amounts of power were needed for distribution, and the chief requisite was that the apparatus should not become heated enough to smoke and that the lamps should not dim noticeably through voltage drop from no-load to full-load.

Even at that early date some attention was given to the question of possible improvement in the quality of the laminations on account of the relation to inherent losses and the effect upon efficiencies. However, such a matter as the reluctance of magnetic joints, its effect upon regulation, and the consequent energy losses and heating in the neighboring iron parts invaded by stray flux was hardly appreciated. In fact, it might be said that a transformer in those days was little more than a bunch of iron and some coils of wire, with enough insulation thrown in to keep them apart.

All of the above conditions have been gradually changed, and with the demand for constantly increasing amounts of power for different purposes, units cooled by natural radiation have long since become inadequate, and artificially cooled transformers have come into existence necessarily for the greater portion of the business.

Up to the present time the ratings, voltages and operating requirements have steadily become greater, and with the increased duties simplicity of design has gradually disappeared until now many large, modern units are quite complicated. They are very often provided with numerous taps, arranged for various connections, and must frequently meet very severe specifications as to performance. This condition requires great practical knowledge of the magnetic and dielectric properties of the various materials used in construction. Extensive experience in the use of design constants is also essential to predetermine correctly the operating characteristics of apparatus on which close guarantees usually have to be made.

The increased complication of designs is due to the fact that the transformer is the connecting link between standard generating and receiving apparatus. In order, therefore, to meet the various and often varying conditions of service, transformers must make up the lack of flexibility of these units to a greater or less extent. They must be capable of a range of voltage in some cases in comparatively large steps, and in others by very small or even insensible gradations, as, for instance through the agency of dial switches.

Transformers are often made with taps to allow for a definite line drop of 10 per cent in 2.5 per cent steps, a change from one tap to another being made by easily connected straps. The taps were formerly in the outside coils, but now are usually arranged in the center portion of the high-tension winding, where the electric stress is a minimum, provided the installation is in normal condition. With this arrangement it is necessary merely to open the line switch and adjust the voltage connections, which can be done without disturbing the line terminals.

In high-voltage transformers the outer turns of the primary winding are reinforced by an extra wrapping of insulation. They are thus quite effectively safeguarded against electric strains many times normal that may result from disturbances occurring during lightning storms or resulting from surges due to other causes.

The first artificially cooled transformers of which the author has knowledge were of approximately 30 kw rating, of the air-blast type and wound for 10,000 volts on one side and about 300 volts on the other. Units of the air-blast type have since been made in 6000-kw sizes, three-phase, and 3000-kw, single-phase, and they can be wound for any e.m.f. up to 33,000 volts. This e.m.f. is taken as the limit on account of the appearance of corona and dielectric hysteresis when higher potentials are attempted.

For higher voltages oil-immersed transformers become a necessity for moderate-size, and the water-cooled type for larger ratings, the oil being an insulator of great effectiveness, and a cooling medium of high efficacy. The cooling coils through which cold water flows are located at the top of the transformer tank in the hottest oil, and, therefore, most effectively remove the heat accumulated by the oil in its passage through the ducts in the winding and other parts.

The water-cooled type has been necessarily the most popular design. It has greater ability to carry overloads than has the air-blast type, and can be wound for any voltage. Such transformers have been manufactured in sizes up to 6000 kw, single-phase and and 10,000 kw three-phase.

In general, the almost inestimable advantage of the immersion of transformers in oil lies in the properties of the special quality of mineral oil used, which, in addition to other good effects, also eliminates corona and static charges, such as would make air-blast transformers absolutely out of the question.

The Middle West and Pacific Coast opened the field for high-voltage work, the dry climate being considered nearly ideal for the high-voltage line. Now, however, large installations of 100,000-volt transformers are being made in the Southern States, as well as in Canada and some of the Eastern States.

In California the Great Western Power Company has in operation 10 three-phase, 60-cycle, 10,000-kw, 100,000-volt transformers for the step-up end of its 150-mile transmission system, with a number of smaller single-phase units for distribution of energy at various points. The company also has three tie-in 5000-kw transformers wound to change the e.m.f. from 90,000 volts to 55,000 volts. All of the transformers are wound for delta connection on both sides.

The most notable system, however, from the standpoint of voltage, is that of the Stanislaus Power Company, also of California, where there are about to be installed six single-phase, 3750-kw transformers, whose maximum high-tension e.m.f. is 138,500 volts, in star. The units have nearly all been completed and have passed tests without showing the slightest sign of weakness, even under the severe high-potential test of 280,000 volts. This company has also had in service for some years a number of single-phase, 2233-kw transformers wound for 104,000 volts, star-connected.

Another system of importance is that of the Southern Power Company, where there have been added some 1000-kw and 3000-kw, 100,000-volt, single-phase transformers.

At the plant of the Central Colorado Power Company there has been in successful operation for several months a large number of 90,000-volt and 100,000-volt, single-phase units in sizes, ranging from 400 kw to 3330 kw.

There are also soon to be installed many 750-kw and 1250-kw, 60-cycle, single-phase, 110-000-volt transformers by the Hydro-electric Power Commission of Ontario.

Many more plants might be mentioned, but those referred to will give an idea of what is being accomplished in large high-voltage transforming apparatus at the present day.

All of the above-mentioned apparatus is of the water-cooled, oval-tank design, and in most cases it will be observed that the units are single-phase. This type is most generally desired for large transformers on account of the ease with which a unit may be removed in case of necessity, with the least disturbance of the service connections.

Another variety of large, water-cooled transformer, known as the forced-oil type, has been brought out within the past few years. In the first designs the oil-cooling apparatus was exteriorly situated and consisted of a special water-cooled condenser, through the tubes of which the oil from one or more transformers was circulated by a pump. By this method any liability of water entering the oil through leakage was reduced to a minimum because the oil in such a case would enter the water, due to its higher pressure. Moreover, any transformer could be isolated from the others in case of trouble by means of valves properly located.

In recent designs, however, cooling coils are located within the transformer tank, being separated from the main body of the oil by a sheet-metal diaphragm. The heated oil is pumped from the top of the transformer and discharged into the upper part of the cooling compartment, and by continuous operation of the pump the cooled oil flows out from the bottom of this compartment and up through the spaces in the winding and around the core. The pump is usually located close to the transformer.

These units with their cooling outfits are, therefore, self-contained, and thus differ markedly from the earlier form, in which this outfit was separate. When operating conditions are such that this type would be economical, a saving in cost can be effected as compared with the regular water-cooled design. It may be stated, however, in general, that this type is not usually desirable in sizes under 2500 kw, single-phase, or below three times this rating three-phase, for e.m.fs. around 60,000 volts. When higher voltages are required the sizes should be larger.

There are several installations of these transformers in various parts of the country, the oldest, and probably the most important, being that of the Great Northern Power Company, at Duluth, where the units are rated at 7500-kw, three-phase, wound for a high-tension e.m.f. of 60,000 volts.

Generally speaking, in the earlier transformer designs all leads were brought through the cover and the transformer itself was bolted to the tank base. In modern machines only those leads are brought out that are required for regular service, all others being carried to connection boards located under the oil. The transformers are not bolted to the bases, but are usually suspended from the cover, which is provided with suitable lifting lugs, and by the aid of a crane and sling can be readily raised when reconnections are required. When this procedure cannot be carried out for lack of a crane, the oil in the transformers can be slightly lowered and the changes in connections made through the manhole in the cover. This arrangement obviously makes modern transformers neater in appearance than were the older types with numerous leads and bushings, and also much safer, because the taps and connections are under oil.

Water-cooled, single-phase transformers in round tanks have recently been produced in sizes up to 2000 kw. In this design the covers are comparatively light castings, while the interior parts are largely of structural steel. A minimum floor space is occupied, and as light parts as possible are used without sacrificing desirable characteristics of strength, operation and efficiency. The transformers can be as easily lifted out of the tanks as in the cover-suspension type, but the arrangement is somewhat different.

Three-phase transformers, owing to their oblong proportions, and the large single-phase type are generally best accommodated in oval tanks as in the past.

Regarding complicated designs, many examples can be given, but it will suffice to cite two instances to show what manufacturers are oftentimes required to furnish in order to meet special conditions. In one instance, several 875-kw, single-phase, water-cooled transformers, made some five years ago, were designed for 38,000 volts high tension with four independent windings on the low-tension side; one of the latter had a rating of 625 kw with an e.m.f. range of from 2470 volts to 2300 volts, which could be varied between these limits by means of a dial switch in approximately 45-volt steps for supplying energy to lamps and small motors. Each of the other three individual circuits was rated 375 kw for delivering energy to rotary converters, the e.m.f. of each circuit being 353 volts maximum with a tap at 309 volts, and with starting taps for approximately one-third and two-third values.

It will be noted that the sum of the kilowatts in the low-tension winding is more than equal to the kilowatt rating of the transformer, but the requirements of the installation were such that full outputs of all the circuits were not needed simultaneously and the loads were so adjusted as not to exceed the kilowatt rating of the high-tension winding. The company operating the transformers has a large number of other sizes of similar design and has always been satisfied with their performance.

In general, it may be stated that it is not desirable to have such a mixture of windings for different purposes included in single units, but the conditions under which the transformers referred to are operated are peculiar enough to make it feasible in this case.

Several years ago some single-phase, 450-kw, air-blast transformers were made that cannot well be called simple in design. The high-tension coils were wound for 2000 volts, three-phase, and the low tension from 258 volts to 162 volts, two-phase, and were assembled as "main" and "teazer" in one unit. The high-tension winding was provided with 140 taps, which were brought out to four dial switches mounted two on each broadside of the transformer. All of the switches were mechanically interconnected so that they operated practically in succession by means of a small motor mounted on one end of the transformer case. The switches were operated from a remote-control panel on the switchboard, and the motor was provided with a circuit-breaker and a limiting switch. The low-tension side of the transformer was bar wound and provided with a neutral tap. About a dozen transformers were built and have been in successful operation for many years.

Modern transformers must contain the latest improved magnetic steel, in order to keep up with general progress, and all insulating material used must be covered by specifications based upon years of experience and investigation. The puncture and leakage strength of the insulation of up-to-date transformers has also been greatly increased by improvement in quality and new methods of application.

ESTIMATED COSTS OF A STEAM PLANT AND A GAS-ENGINE STATION.

In a recent report upon the power situation in a large manufacturing plant, Mr. F. W. Dean, of Boston, submitted estimates of the cost of installation and operation of a 1000-hp steam-electric plant and a 600-kw gas-engine installation, with electric generating equipment. The steam plant cost was as shown in the accompanying table.

INSTALLATION COST ESTIMATE 1000-HP STEAM STATION.

Engine and condenser, $20 per horse-power	$20,000
Foundations, $5.50 per horse-power	5,500
Generators, $12 per horse-power	12,000
Boilers, $7.50 per horse-power	7,500
Smoke flue, 75 cents per horse-power	750
Chimney, $2.50 per horse-power	2,500
Heater, $1 per horse-power	1,000
Pumps, 50 cents per horse-power	500
Buildings, $20 per horse-power	20,000
Total cost	$69,750

The cost per horse-power is thus $69.50. The annual cost of operation was figured as follows, assuming 310 days of operation at nine hours per day:

The fuel consumption was based upon a steam plant consuming 1.75 lb. of coal per hp-hour, with a steady load during the hours of service.

The installation cost of a gas-producer electric plant consisting of two 300-kw generators and engines, with anthracite producers, was figured at $67,500, which Mr. Dean considered substantially equivalent to a plant of 1000 indicated hp. The

gas engines were to be of the horizontal, double-acting type, and the generators were taken as 220-volt, 60-cycle machines, with two exciters included. The installation cost was estimated as given below.

The total fuel consumption was figured at 1786 tons for the year at a cost of $2.25 per ton in the locality where the

ANNUAL OPERATING COST PER HORSE-POWER, STEAM PLANT.

Fixed charges, 13 per cent of $69.75	$9.07
Attendance	3.21
Oil, waste and supplies	.21
Fuel, 2,241 tons, at $2.75 per horse-power	6.71
Total	$19.19

plant was situated. As with the steam plant operation for nine hours per day at steady load and for 310 days per year was as-

INSTALLATION COST OF 600-KW GAS-ENGINE PLANT.

Two gas engines	$21,000
Two 300-kw generators	6,600
Two exciter sets	3,000
Two anthracite producers	7,700
Freight and erection	3,800
Foundations	1,100
Buildings	20,000
Contingencies	4,300
Total	$67,500

sumed. In view of the resulting close annual cost of the two plants, per horse-power, the report concluded with the recom-

ESTIMATED COST OF OPERATION, GAS-PLANT.

Fixed charges on plant, 14 per cent of $57.50 (per horse-power)	$9.45
Attendance per horse-power per year	3.21
Oil, waste and supplies	.50
Coal, 2 lbs. per kw-hour, including stand-by losses	4.02
Total	$17.18

mendation that the establishment install the steam plant on account of its greater reliability and the more common experience which it has enjoyed.

COMPULSORY WORKING OF PATENTS IN ENGLAND

By a British Barrister-at-Law.

ARTICLES have appeared in these columns from time to time explaining the object and effect of the English patent act recently passed to compel persons foreign to England who holds English patents to work them in that country. The act was hailed with shouts of joy in England, but the cries have now died away and those who thought that this measure was going to prove useful to English manufacturers are having an opportunity of studying the remoter consequences of the legislation. To state its effect in a few words, this measure, which came into force in 1907, provides that unless an English patent is worked in England to an adequate extent it may be revoked.

Cogent arguments are now being put forward in England in order to prove that the compulsory working of patents is a mistake. In the first place, reference is made to the report of an influential committee appointed by the English Board of Trade in 1901. That report contained the following passage: "A suggestion has been made that some plan for the defrayment of a patent in the event of its not being worked in this country would be preferable to the compulsory granting of licenses. We are not able to accede to this suggestion."

At a congress held at Vienna in 1897 the following resolution was passed: "The congress is of opinion that it will in future be necessary to give up the principle of compulsory working." The same association at a congress in Berlin in 1904 proposed the following resolution: "Neglect to work a patented invention should entail, not the avoidance of the patent, but a compulsory license drawn up in accordance with the internal laws of each country." This resolution was passed by a large majority, and has since been confirmed at the congresses held by the same association at Liége in 1905 and at Milan in 1906. As a result, however, of the Compulsory Working Act in England several other countries which had shown a tendency to cease the enforcement of compulsory working have become more strict.

Among the objections to compulsory working the following may be enumerated:

(1) The inventor is uncertain whether he will have the benefit of his monopoly for 14 years. Consequently he will find it difficult to get hold of a capitalist to finance him.

(2) Those who advocate compulsion imagine that patentees are not willing to carry out their inventions. This is not the case. In 90 cases out of 100 the reason why a valuable invention is not carried out is not the unwillingness of the inventor, but the inertia and conservatism of the trade and the difficulty of assuring capitalists that there is some real legal protection for the invention.

(3) The fact that patented industries have thrived in England and the United States is strong evidence that compulsory working is unnecessary. An inventor always tries to work his patent in his own country, and if successful there he tries it elsewhere. When looking for a country abroad he naturally seeks one in which he is likely to get the greatest amount of protection.

The policy of the act of 1907 was thus described by Mr. Lloyd George, who was its chief promoter. He said: "The main object of the bill is to prevent the patent laws from being used for the hindrance and suppression of British industrial development."

The change was advocated because, as was the undoubted fact, one or two industries had suffered owing to persons foreign to England taking out patents in England and holding them up. The idea thus got abroad that there were many blocking patents in force in England, and as a result the act was passed into law.

Coming now to the result of the act, what do the statistics reveal? At the recent general election much capital was made out of it on political platforms. It was claimed by the Conservative party in England that the act was an argument for protection, inasmuch as the direct result had been to induce the German and American manufacturers to establish works in England, and so give employment to British workmen. There is some evidence to support this suggestion. Some 20 companies or firms have established works in England, entailing capital expenditure on land of some £100,000 and on machinery of £200,000, most of which was probably imported. It is to be borne in mind, however, that this expenditure was incurred in order to support the validity of existing patents, many of more than four years standing, the success of which had already been proved, and in respect of which a demand for the patented article in this country had been actually created. It has been suggested by the president of the Institute of Patent Agents in England that probably under the existing law, and in view of the deterrent effect of S. 27 against foreigners patenting their inventions in England, such patents might never have been taken out in England, and so the industries would never have been introduced into England owing to the absence of some assured protection or monopoly warranting the expenditure of capital.

When account is taken of the number of cases in which the penal provisions of the act have been put into force, the small effect which it has produced is somewhat remarkable. Roughly speaking, there are always about 100,000 patents in force in England. Eleven patents have been revoked by consent; four have been revoked after a sharp contest. Only one patent has been revoked at the instance of a British manufacturer, who stated that he was anxious to manufacture the patented article in this country. An attempt was made to revoke two further patents with the object of obtaining the right to import goods manufactured abroad, but the attempts were unsuccessful. The results attained are, therefore, infinitesimally small compared with the 100,000 existing patents, even after deducting from this number those patents which may be considered of minor importance; and this, in itself, is claimed to be an absolute proof of what a small call there was for this very serious and drastic alteration of the law, an alteration practically admitted by all countries from many years' experience to be a mistake.

There can be no question that those who have been most

strenuous in advocating this change in England have omitted to take the remoter consequences into account. In the first place, other countries are sure to retaliate. If America or Germany should compel the English manufacturer to work his patents in these two countries he will be compelled to remove some of his capital abroad and employ foreign labor. Such a movement would not benefit British industry. The act has also had an effect upon the finances of the English Patent Office. Applications for patents by residents in colonies and foreign countries fell off from 9990 in 1907 to 8262 in 1909. All that means a decline in the revenue of the office. Again, it is not only the retaliation of foreign countries that England has to fear. Her own colonies threaten to establish the system of compulsory working. Any such step on their part will be fraught with grave consequences to the English manufacturer, as it will narrow his market.

Another point, which was overlooked during the agitation which secured the passing of the act of 1907, is this: If the foreigner is compelled to come and manufacture in England it is probable that he will not be able to do so so cheaply as he can at present. That means added cost to the consumer.

In these circumstances it will not be surprising to find that, in a few years, an agitation will spring up in England for a repeal of that part of the act of 1907 which makes the working of patents compulsory.

COMPARATIVE COSTS OF ELECTRIC AND GASOLINE SOLDERING.

By WILLIAM J. MISKELLA.

We read occasionally articles on the comparative costs of electricity and gas and very little on the comparative costs of electricity and gasoline as applied particularly to soldering. The table below should, therefore, prove of some interest in as much as some exceedingly important deductions may be made therefrom and that may come as a surprise to a great many soldering-iron users who have been accustomed to other methods than electric.

The installation which furnished the data for this table is located in the factory of the Formofume Company, of Michigan City, Ind., where the writer has been closely in touch with it.

COMPARATIVE COSTS OF ELECTRIC AND GASOLINE SOLDERING.

	Electric.	Gasoline.
Energy per 10-hour day, watt-hours	2,500	....
Fuel, per 10-hour day, gal	....	0.75
Time tool is using energy per hour, min	32	60
Cost of electric energy, cents per kw-hour	9	....
Cost of fuel, cents per gal	....	16
*Output per 10-hour day per man, number of pieces	41	32
Cost of operation per 10-hour day, cents	12	12
Cost per piece, cents	0.295	0.375
Cost of coppers, cents	75	40
Life of coppers, hours	140	300
Pieces produced during life of copper	574	960
Cost of coppers per piece, cent	0.13	0.041
Total cost per piece, cent	0.425	0.416

*The pieces referred to are galvanized iron tanks, called air moisteners, the details of which are given in the body of the article.

This company manufactures an air moistener, the metal part of which consists of a galvanized-iron tank about 12 in. high, 12 in. long and 2.5 in. wide. The top and bottom of this tank or moistener is somewhat irregular in shape, consisting of three semicylindrical flutes on each side. In assembling, it is necessary to solder in the top complete and the bottom complete and to seam each side of the moistener. No. 26 galvanized iron is used and to insure a water-tight tank raw acid is used a flux.

By referring to the table it will be noted that the output is greater where the electric iron is used and the reason for this may be accounted for through the rapid deteriorating effect of the gasoline copper, which means frequent cleaning, consequently loss of labor in addition to the time taken by the operator to regulate the furnace. Each user of the electric tool is instructed to clean his tip regularly every three hours with a weak solution of sal ammoniac. Here it may be noted that this sal ammoniac solution is made up by the foreman or some other person and distributed regularly to the various soldering positions, and the fact is not published that a weak solution is used, because most solderers feel that a cleaning solution will not do "justice" to the tip unless it is very strong. Each user is instructed personally by the foreman regarding the care that is expected of the electric tool while in his charge, and the fact is worthy of mention that when this method of procedure is used, the indirect results that are accomplished thereby are surprising. For instance, we have taken men who have never done any soldering, taught them the electric way, and, strange to say, they soon surpass the fellow who claims to be an expert solderer.

In this particular installation there was some question at the start as to what sort of fuel should be used for the soldering coppers. Gas was given up entirely because of the high price of $1.10 per 1000 cu. ft., and on account of the very poor quality. The matter resolved itself into a choice between gasoline and electricity. A gasoline furnace and a single electric soldering copper were purchased and preliminary tests made, the indications of which were in favor of the electric tool, providing it could be used economically on the lighting circuit. In fact, the gasoline furnace was almost given up without making any comparison because it would be necessary to keep on hand a larger supply of gasoline than the fire underwriters would allow, and it happened that there was no convenient place to store the gasoline outside. Likewise the electric method met some opposition because of the attitude of the local electric company in not wishing to give a better rate than the regular lighting rate, because this installation was on its 110-volt lighting circuit. Their motor circuit is 140-volt and an electric soldering tool cannot be purchased at the present time which will operate on this voltage.

At any rate, six electric tools were installed (No. 300 Vulcan soldering tool); five having a consumption of 250 watts, for soldering the tops and bottoms of the moisteners described above, and one, having a consumption of 350 watts, to do the side seaming. It may be noted here that on account of the small size of the shop and the large output required of it, it was necessary to work some solderers nights, and this means that from two to three of the five 250-watt tools were used 22 hours per day.

It is interesting to note that the electric tool uses energy only about one-half the time it is in operation. This is accomplished by a scheme which enables the foreman to watch the workers. A double-pole, single-throw switch is connected to circuit in such a way as to connect a 4-cp red lamp in multiple with the tool. By this means the connection of the tool is strikingly indicated and in addition to promoting economical usage it prevents a tool being left in circuit over night and thus incurring fire risk.

AN ACID-ALKALI-PROOF STAIN FOR STORAGE-BATTERY SHELVES.

By FREDERIC BONNET.

When wooden shelves are to be used for storage batteries, engineers often desire some good coating or treatment for the wood which will preserve it from the acid or alkali used. Wood seems, moreover, to be the most satisfactory material for such a purpose, since metal is so easily corroded, even when heavily coated with such protecting coatings as asphalt paint. Ordinary paint on wood becomes brittle and is apt to spall off, leaving the surface exposed to the corroding influences.

A treatment which has been used for a number of years on the desks of chemical laboratories has been found very satisfactory for storage battery shelves and supports. It gives the wood a beautiful satin-like black finish, and not only makes it resist the action of acids and alkalis, but also raises the ignition point so that it becomes in a sense, fireproof.

The stain is the well-known aniline black, which is produced in the fibre of the wood by alternately applying the following two solutions:

Solution A.—This is made by dissolving 1 part by weight of aniline hydrochloride or chlorhydrate, and 1 part by weight

of sal ammoniac (ammonium chloride), in 6 parts by weight of water, warmed if necessary.

Solution B.—This is made by dissolving 2 parts by weight of blue vitriol (copper sulphate), 1 part by weight of chlorate of potash, in 12 parts by weight of water, warmed if necessary.

The surface of the wood should show a freshly planed surface and be free from oil which would prevent the solutions from soaking in properly. Solution A is first painted over the dry surface and allowed to soak in and dry thoroughly. Then a coat of B is applied. Two more coats of each are alternately applied in this way, and are usually sufficient. It is important that the drying should not be too rapid, otherwise the solutions do not penetrate the wood as they should. After the above treatment the surface takes on a yellowish-green tint and is covered more or less with small crystals from the evaporated solutions. Soap, usually in the form of soap powder, is next sprinkled over the surface, wet with water and scrubbed thoroughly, and the surface washed off with plenty of water. This soaping brings out the brilliant black color. When dry, raw linseed oil is rubbed well into the surface.

The acid and alkali-resisting quality of this stain is doubtless due most particularly to the pore-filling copper soap which protects the wood beneath by being, in a sense, water-repelling. It does not, in consequence, allow the surface to become wet with corroding liquids. The solutions keep very well in stoppered glass containers.

Worcester Polytechnic Institute.

Central Station

Management, Policies and Commercial Methods

A SUCCESSFUL METHOD OF SOLICITING INDUSTRIAL MOTOR BUSINESS.

Under the heading "Central-Station Power," the North Shore Electric Company, of Chicago, is distributing to industrial power "prospects" the leaflet which is reproduced in fac-simile herewith. As shown, the company gives a list of its factory customers taking over 100 hp in electricity to operate motors. A blank space is left at the end of this list, and the company says, at the bottom, addressing the prospective customer; "Eventually your name will be added to this list. Why not now?" Mr. John G. Learned, general contract agent of the North Shore Company, who has devised this scheme, sends out this little circular with a personal letter in which he calls attention to the existing list of power customers. The direct and straightforward method of the company in giving the list of its factory customers, and its willingness to refer the "prospect" to any one of them, are effective, convincing the man addressed that the company is open in its methods and is confident that every large customer will give a satisfactory answer to inquirers. The expedient of leaving the space blank at the end of the list and saying that the company addressed will eventually be on the list, also has an effect, as it makes a direct personal appeal and classes the recipient of the circular with some important companies. Mr. Learned reports that good success has been achieved by this simple but carefully thought out piece of advertising literature, and the idea may prove serviceable elsewhere.

NORTH SHORE ELECTRIC COMPANY

Our electric service is the best for industrial power.

Ask any of the following:

Abell Equipment Company Chicago Heights, Ill.	125 H. P.	**Wilder, Manning Tanning Company** Waukegan, Ill.	200 H. P.
American Brake Shoe & Foundry Co. Chicago Heights, Ill.	110 H. P.	**Vulcan Louisville Smelting Company** North Chicago, Illinois	135 H. P.
Bliss & Laughlin Harvey, Ill.	120 H. P.	**The Buda Company** Harvey, Ill.	200 H. P.
Blue Island Rolling Mill & Car Co. Blue Island, Ill.	1200 H. P.		
Chicago Hardware Foundry Co. North Chicago, Ill.	500 H. P.		
Featherstone Foundry Company Melrose Park, Ill.	250 H. P.		
Federal Stone Company La Grange, Ill.	300 H. P.		
Forest Park Amusement Co. Forest Park, Ill.	134 H. P.		
Illinois Brick Company Bernice, Ill.	600 H. P.		
Jos. Joseph Bros. & Company Chicago Heights, Ill.	150 H. P.		
National Malleable Castings Co. Melrose Park, Ill.	187 H. P.		
Mears Slayton Lumber Company Evanston, Ill.	120 H. P.		
J. & A. C. O'Laughlin Bellwood, Ill.	300 H. P.		
Rogers Grain Company Harvey, Ill.	475 H. P.		

Eventually your name will be added to this list.

WHY NOT NOW?

Reproduction of North Shore Electric Company's Leaflet.

THREE-PHASE VS. SINGLE-PHASE GENERATION AND DISTRIBUTION FOR SMALL CENTRAL STATIONS.

The question whether to distribute single-phase or three-phase is of considerable interest to numerous small central-station companies. Undoubtedly many small companies have gone to considerable expense to establish three-phase generation and distribution, when single-phase would be better adapted to their needs. The idea that the polyphase distribution is the only proper method has been the result of blindly following what is good practice for large companies. It may not be good practice under certain conditions for the smaller companies.

In small towns there is rarely any call for motors larger than 40 hp. In fact, if motors larger than this are called for the central-station company, on account of limited equipment, is likely to be in a position where it cannot supply energy to such large motors without seriously disturbing its voltage regulation. Successful single-phase motors can be obtained in ratings up to 40 hp, which are somewhat more expensive in first cost than three-phase motors, but are likely to be more satisfactory to the small central station supplying energy to the motor, because of the fact that such motors usually employ the series repulsion principle, with a commutator for starting, and hence call for less starting current than does a squirrel-cage, three-phase induction motor.

The single-phase distribution is much cheaper and simpler for the central-station company. On the other hand, the central-station business is a growing one, and every central-station company must be looking to the future when its system will be much larger than at present. There is a certain class of very small central stations which has no use for anything more than single-phase distribution. When the station gets a little larger it is advisable to work gradually into three-phase distribution for motor supply, so as to be prepared to supply energy to some of the larger motors which may be used.

As an illustration of a method which can be pursued to advantage, the plans of a small company which is growing very rapidly may be taken as a specific example. This company now has a 50-kw, single-phase generator and a 75-kw, single-phase generator. There are several single-phase motors connected to its line. These are of the commutator repulsion-starting type, so that the starting current and the consequent disturbance is reduced to the lowest possible point. As the town in which this company operates is growing very rapidly, it seems best to the management to be prepared to furnish

three-phase motors in the future. Consequently a generator, which is now being ordered to enlarge the plant, will be a three-phase machine rated at 150 kva. This generator, however, will be coupled to a gas engine of only 150 hp. The idea under lying this peculiar combination is as follows:

The new generator at the beginning will be operated simply as a single-phase machine, only one of its phases being utilized. As a single-phase machine it will operate for peak loads up to the rating of the engine, when working at 95 per cent power factor. After a few years, if the system grows rapidly, this generator can be used for giving three-phase motor service. In the event of such growth, however, it seems probable that the principal use of the 150-kva, three-phase generator, now being installed, will be to carry the light 24-hour load of the plant. So large a percentage of this 24-hour load will consist of motors that its power factor will be very low. With such a low power factor it is probable that no more load can be placed on the 150-kva generator than the 150-hp engine will carry. The only disadvantage of this arrangement is that it could not carry a three-phase load of 150 kva at 90 or 100 per cent power factor. Such high-power factors, however, occur only during peak load hours, when most of the load consists of lighting. As the lighting distribution will always be by single-phase circuits tapped from three-phase bus bars, these single-phase circuits can be distributed among the different phases, so as to keep a proper load on this particular generator. If the plant grows so that other and larger generators are needed they, of course, will be three-phase and installed according to ordinary practice, so that the engine will carry the full load of the generators, if the generators are loaded on all three phases, with a load having 80 or 90 per cent power factor.

CENTRAL-STATION COST DISTRIBUTION.

By G. E. Miles.

A system of work-orders and time cards for the easy and accurate distribution of the cost of labor and material among the various investment and expense accounts is a valuable aid to the central station. The following system was devised by the writer for use at a central station having about 450 customers and was found to answer the purpose so well that he thought perhaps the readers of the *Electrical World* might be interested in it.

At the station referred to a system of accounting is used in which all investment accounts are represented by a letter and all expense accounts by a number. Investment accounts include the installation of all new machinery and apparatus, all line extensions, and, in fact, all additions to the system. Expense accounts include everything connected with the operation

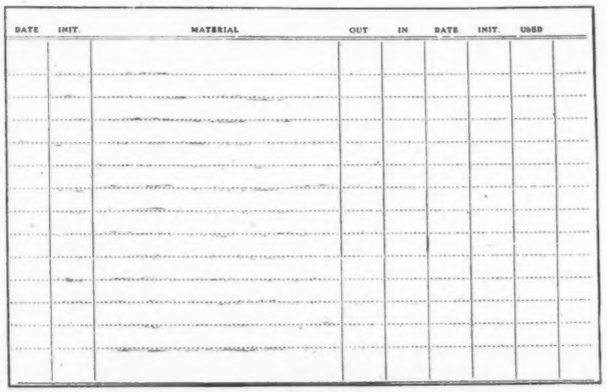


Fig. 1—Cost Card.

and maintenance of the system. A few of our accounts are represented as follows: Steam plant additions, *D*; electric equipment at the station, *E*; line extensions, *F*; fixtures and supplies when the company does house wiring, *Q*; power-plant wages, that is, the wages of the engineers and firemen, 1; cost of fuel, 2; care of arc lamps, 15; setting, testing and reading meters, 16; line repairs, 20, etc.

With this system work-orders and time cards are used as follows: When a piece of work is to be done, the foreman or bookkeeper fills out a work-order, putting in the space

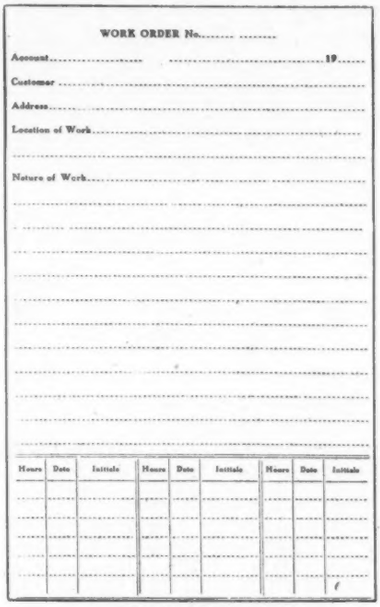
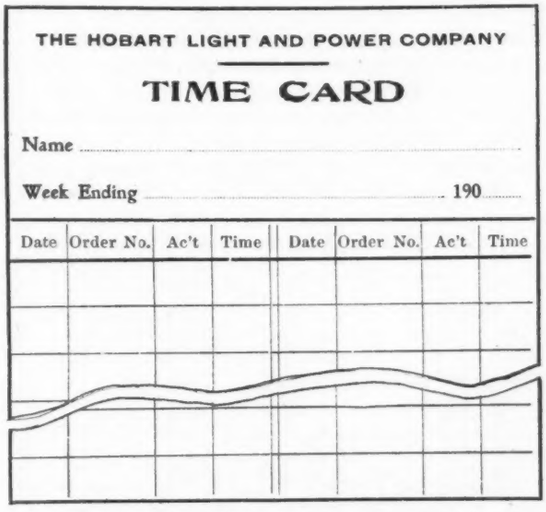


Fig. 2—Work Card.

marked "Account," the proper letter or number to designate the account the job is to be charged to. If it is to extend the line, the letter is *F;* if to set a meter the number is 16, and if to reset a rotted pole it is 20. The workman takes the order and marks in the blanks on the back all the material he takes from the storeroom for the job, and when the job is finished he marks in the proper space all the material brought back. Each night, while working on the job, and when the job is completed, he enters in the proper spaces his initials, the date and the time put on the job. At the same time he enters on his time card in the spaces provided the work-order number, the



Fill out Time Card carefully, and be sure to put your time on both work order and time card. Add up your time for each day and week.

Fig. 3—Time Card.

account letter or number and the hours spent on the job. Each time card is intended to hold a week's time. The foreman should check up the time cards daily, for few men can be found who will be as careful as they should be about keeping track of their time and material used. From the work-orders

the bookkeeper can figure out the cost of the labor and material used on the job, and from the time cards he can readily get the proper distribution of the workman's time. At the station referred to the men are paid monthly and the bookkeeper makes out the payroll from the time cards, putting on the roll the number of hours each man has worked, his wages for the month and the total of the roll. On a separate sheet he puts the distribution of the payroll as a whole, which he readily determines from the time cards. He makes out from the work-orders a report of the material taken from the storeroom and the distribution of the same among the various accounts. The distribution sheets of the payroll and of the storeroom together show the total cost of labor and material put on the various accounts during the month.

The writer has used the above system several years and has found it the simplest and most accurate and complete of any he has ever seen.

REDUCING CENTRAL-STATION PRODUCTION COSTS.

In the course of a discussion at the recent meeting of the Wisconsin Electrical Association, Mr. Harold Almert gave some figures on the operations of a certain central-station company which are of interest. This company is located where artificial gas has been selling at 1.35 cents per 1000. The company had not been active in looking after the quality of its service, and though a new manager took charge about the time that natural gas entered as a competitor, he could at first do little to prevent a large amount of business going over to natural gas. The electrical plant had to be reconstructed and it was impossible to complete this reconstruction so as to give good and economical service in time to head off the new competition. While putting the electrical plant in shape, however, the electric company was not sleeping and started an electrical show to teach the public how many conveniences are incident to electric service. The first year of the new management the cost of generating current measured at the busbars was 1.59 cents per kw-hour. This was brought down to 0.88 cents. The voltage regulation was very closely looked after with the aid of recording voltmeters at various points. While 2 per cent regulation above or below normal was considered good, a regulation of 1 per cent above or below normal was obtained in this case because of the imperative necessity of good service. The cost of distribution was reduced from 0.57 cent to 0.29 cent per kw-hour. The efforts of the new business department were directed in such a way that while there was only 13 per cent increase in the number of consumers, the output was increased 46 per cent, thus obtaining additional revenue for the additional construction expense. Hence, the switchboard operating cost for energy was 3.4 cents per kw-hour the year before the new management took hold and 1.63 cents the next year.

BRITISH CENTRAL-STATION RATES.

By Francis H. Davies.

The subject of rates for electrical energy is at present receiving a considerable amount of attention in Great Britain, where there is, on the whole, a very evident tendency toward simplification and standardization of charges. The question has been brought into prominence by the necessity which is felt in almost every British central station for an immediate and considerable expansion of business to fill the gap in revenue caused by the tungsten lamp. That there has been a very serious falling off in output is shown by the accompanying table contrasting the percentage increase or decrease in kw-hours for 1907 and 1908 of all the companies operating in London of which it is possible to make a comparison. In many quarters it is anticipated that the results for 1909 will show little, if any, improvement, and hence advantage is being taken of every means of popularizing electricity for light, heat and motor service. The feeling is general that rates have been too complicated and inflexible, and the fact is at last appreciated that systems of charging which stand in the way of development must give place to others of a more business-like character.

The accompanying table, which deals only with output, does

	Per cent increase or decrease in kw-hour output. 1908.	1907.
Brompton	−3.9	+7.7
Central	+8.1	+53.8
Charing Cross	+14.7	+13.6
Chelsea	+2.9	+7.2
City of London	+3.6	+9.3
County of London	−2.5	+29.8
Kensington	−0.1	+13.1
Metropolitan	+5.1	+5.0
Notting Hill	+6.4	+6.8
South Metropolitan	+12.1	+23.7
St. James	+5.5	+10.6
Westminster	+6.6	+8.6

not show to the full extent the position of the companies. In every instance the average price received per kw-hour has fallen, owing chiefly to development in motors and other cheap supplies, and hence the monetary return for energy sold is even less satisfactory in its percentage of increase or decrease.

The present position is summed up in the following table compiled from the latest returns of some 450 central-station companies. It should be noted in this connection that the term "flat rate" means a uniform charge per kw-hour and not a lump sum per lamp per year, as in America. This latter method of charging is designated in England "contract supply."

Stations employing "flat rates" only, with and without discounts	119
" " maximum-demand rates only	4
" " sliding-scale rates only	11
" " maximum-demand system and alternative rates	200
" " sliding-scale system among other rates	136
" " two-rate meters " " "	52
" " contract system " " "	95

Although it is always difficult to secure accurate returns on this subject, the above statistics are not wide of the mark, but to some extent they are deceptive and call for comment.

FLAT RATES AND MAXIMUM-DEMAND SYSTEMS.

The stations charging at "flat rates" only include most of the older ones, which when the maximum-demand craze was in full swing were to a great extent proof against its allurements, preferring the established results of the system they knew to the problematic benefits of the newcomer. Events have justified their conservatism, for it will be noted that there are now only four companies which remain entirely faithful to the maximum-demand system, although at one time the latter was the method in greatest use. There is no gainsaying the fact that in England this system has failed commercially and a vast amount of capital is locked up in idle maximum-demand indicators, representing a dead loss. The almost universal adoption of the maximum-demand system at first provides an excellent example of the extent to which fashion prevails even in the material world of engineering. The maximum-demand system was taken up in town after town once the example had been set by a few of the recognized leaders and no new distribution system was considered complete without its more or less complicated system of charging and a stock of demand indicators. This was before engineers began to appreciate the importance of handling their product in a commercial manner. The unquestionable soundness of much of the theory of the maximum-demand system appealed to their trained minds, but it required a prolonged course of sad experience before they came to see that theoretical correctness did not interest the consumer, who was more intent upon knowing exactly where he stood, even if he had to pay more for the knowledge, than in securing that rate per kw-hour which his load-factor warranted. That the system was at one time very broadly applied is proved by the figures given in the table for the fourth class, which is by far the largest. This is now, however, a deceptive figure, since, although some 200 stations are still nominally employing the maximum-demand system, in most cases the greater part of their business is charged upon one or other of the alternative rates offered. There is no means of ascertaining the proportion of kw-hours sold under each charge, but where the inquiry has been made the answer is much the same and to the effect that the maximum-demand system is there if people care to take it. But it is not pushed, and few avail themselves of the sporting chance of securing a lower rate than the alternative flat, sliding-scale or contract charge.

SLIDING-SCALE RATES.

The sliding-scale system is a popular one with alternatives, but only 11 stations employ it solely. It received a setback when the maximum-demand indicator was introduced, but is now coming into favor again, particularly as an alternative to the "flat rate." An example of the sliding scale as applied to ordinary lighting is afforded by the schedule of charges of the Charing Cross & City Electric Supply Company. Ten cents per kw-hour is charged for the first 18 kw-hours per 30-watt lamp installed per annum, and after this all consumption is rated at 4 cents per kw-hour. As accounts are rendered quarterly the 18 kw-hours are split up into divisions of six for each of the winter quarters and three for each of the summer quarters. In another instance, where the consumption amounts to or exceed 5 kw-hours per 30-watt lamp installed per quarter, the whole supply is charged at 10 cents per kw-hour. Should the consumption be lower than this the rate rises to 12 cents.

TWO-RATE SYSTEM.

The two-rate system, in spite of its fairness, is not a popular one since it obtains in only 52 instances. The cause of this is undoubtedly the costliness of such meters and the inconveniences attendant upon their use. The principle is found to appeal to consumers, as there is nothing in it which the ordinary business man cannot at once grasp; but it is too expensive a system of metering to apply to any but fair-sized consumers, and hence is restricted to a comparatively small sphere of usefulness.

Summing up the foregoing rates for electrical energy supply in England have passed through the course somewhat as outlined below. In the very early days a "contract charge" (American flat rate) of a lump sum per lamp per year was universal. This was succeeded by the "flat rate" of charge per kw-hour, which was elaborated in places to a sliding-scale system. Then came the maximum-demand method, and for a time flat and sliding-scale rates were at a discount. Practical difficulties then arose and the maximum-demand scheme began to give way to flat and particularly to sliding-scale tariffs. Now, the contract system in one form or the other has some 95 adherents and is again rapidly coming to the fore as the simplest and most satisfactory system of charging.

The return of the elementary method—often disguised, but still much the same in principle—has been brought about almost entirely by the developments which have taken place in electric heating, cooking and domestic motor service. The two-circuit difficulty has been found serious, for there is no question that the necessity of running separate wires to take advantage of a cheap motor-service rate is one of the greatest deterrents to the widespread adoption of heating and cooking apparatus.

CONTRACT SYSTEM.

Practically every variety of the contract system is in use in England, and each engineer seems to have his own pet variation. In many cases where a small service is concerned a lump sum per lamp per annum is charged, without any conditions beyond lamp wattage, but in the majority of instances there is an additional charge per kw-hour, generally about 2 cents. The City of London Electric Supply Company employs the following schedule for small customers. No meters are installed, but each 30-watt lamp is charged for at the rate of $3.65 per annum, payable quarterly in advance. For each of the winter quarters the charge is $1.22, and half that in the summer quarters. All empty lamp receptacles or connection plugs are charged for, unless sealed up by the company.

The contract principle has, of course, been in use for years in connection with large motor installations, but with the exception of one or two isolated cases it has only recently been applied to lighting for residential or store service. Interest attaches chiefly to the lump-sum charge and the manner in which it is reached. Most of the systems recently introduced and proposed differ in the following respect: In one the charge is based upon the assessable value of the property, the annual fixed charge being 12 per cent of the assessment. In another the maximum demand is agreed between the company and the consumer, and the charge based upon this at so much per kilowatt, a limiting device being fixed which gives warning when the contracted maximum demand is being exceeded. In another system the maximum demand is estimated by the station management and the corresponding annual lump sum paid in advance. A maximum-demand indicator is installed and should the recorded demand exceed the estimate, the consumer pays an additional sum at an agreed rate per kilowatt. There are other variants, but they are so numerous and comparatively unimportant that it is not necessary to mention them in detail.

Another principle which is rapidly gaining ground is a lump annual or quarterly charge for special purposes, such as outside arcs or tungsten groups of specified wattage, made in conjunction with a low rate of about 2 cents per kw-hour for all consumption over a certain amount. This scheme is often arranged to include rental of the wiring and apparatus, which is put in free of charge by the central-station company, which maintains it. A variation and an improvement on this system, which has been adopted in several instances, is to install an hour-meter instead of a watt-hour meter, allowing so many hours' use of the lamps per annum, with an extra charge per hour for all in excess of the agreed number. Consumers are found to appreciate such rates of charge and are undoubtedly easier to obtain on such a basis.

The supply of energy for special services, such as signs, outlining, shop-window lighting after closing hours, etc., as a general rule, is not yet handled in the business-like way apparently common in America. A reduced rate, varying from 2 cents to 6 cents per kw-hour, is almost universal, but in many cases it is quite unjustifiable, as consumers possessing signs often use them only at the time of peak load, extinguishing them when the premises are closed. Matters are improving in this respect, but until the company does the switching, as in some cities in America, and charges a fixed amount per sign per annum for a given number of hours' use, it is improbable that the average small sign owner will reach a load factor which really warrants the low rate. Only a few central-station companies offer a special charge for late window lighting, and very few, if any, contract for this class of business. Basement premises and other situations where light has to be used all day are catered for by the larger companies upon much the same rates as signs, but in many places throughout the country no special terms are granted with the result that gas holds possession of the field. This is typical of the lack of enterprise shown by the management of many of the smaller companies, but happily there are indications of a more progressive policy being adopted.

The principle of varying the charge according to the situation of the premises to be lighted is adopted by the Charing Cross & City Electric Supply Company on the following schedule:

Basement, stair and corridor lighting (separately metered)	6 cents per kw-hour
Premises with basements (one meter)	7.5 cents " "
Ground floors, alone or in conjunction with upper floors	8 cents " "
Premises above ground floor	9 cents " "

As with all matters of this nature, the standardization of rates will take a long time to accomplish, but it is being talked of. The need is particularly felt in and around London, where householders changing from one district to another are almost invariably faced with something new in the form of lighting rates, or alternatives not previously open to them, the comparative value of which they do not understand. It is very naturally felt that such a state of affairs is not the most advantageous for the lighting companies, for this condition certainly leads to many difficulties and disputes. With gas companies the tariff is practically standard and absolutely simple, the consumer finding only a slight variation in the price per 1000 cu. ft. He naturally contrasts this with the diverse and perhaps complicated rates of the electric companies with conclusions which are not to their advantage and do not tend to friendly business relations. There can be no question that so far as London is concerned standardization in the method of charge, if not the price, would be highly advantageous and there is every indication that some movement of this nature will shortly be set on foot.

Wiring and Illumination

EXPENSIVE WIRING NOT ALWAYS DESIRABLE.

In interior wiring work, as well as in other industries, the best is not necessarily the most desirable, if by best is meant the most expensive. There are cases when even the cheapest is the best for the work to be performed. For instance, in the wiring of theaters, the borders must be wired with slow-burning insulated, instead of rubber-covered wire, for the reason that the heat developed in the lamps causes the rubber insulation of the wire in the conduit over them to deteriorate so rapidly as to make rubber insulation useless. In some arrangements of footlights also, slow-burning insulation is preferable to rubber for the same reason, although the Code calls for rubber-covered wire in conduit in ordinary footlight construction. In the New Theater, in New York City, for example, where "linolite" lamps are employed in the footlights, the rubber-covered wire had to be replaced with slow-burning insulated wire because of the heat. There are many other places where the heat renders it desirable to install the cheaper wire, of course, with the sanction of the Underwriters if the Code specifies rubber-covered wire.

ELECTRICAL SUPPLIES AND AUTOMOBILE SUPPLIES.

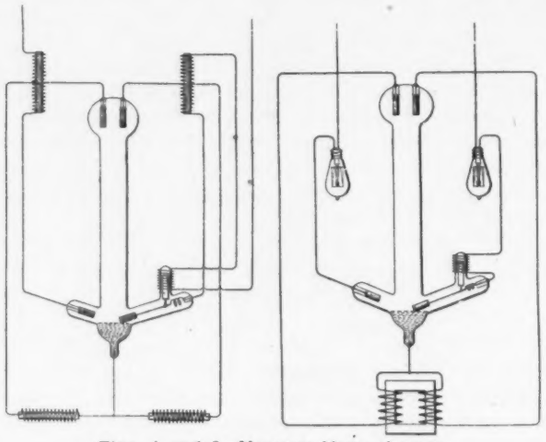
There are many good reasons in small towns why electrical supplies and automobile supplies should be carried by the same concern. In connection with automobile supplies there are articles of an electrical nature which the electrical supply house can carry to better advantage than any other, because they require electrical men for intelligent handling. It is also frequently the case in smaller towns that there is hardly sufficient business to justify a purely electrical supply house, and the same may be said of the automobile supply business. By combining the two there is enough business to justify a business man of some ability undertaking the venture.

The electric lighting of gasoline automobiles is destined to become increasingly popular, because of the recent adaptation of the tungsten lamp and properly designed reflectors to automobile lighting. With the tungsten lamp it is possible to light an automobile with a reasonable size of storage battery. Of course, these batteries(like the storage batteries used for ignition purposes) require some intelligent care and regular charging. This can better be done by an electrical supply house than by employees of a garage who know nothing of electrical matters. It is now no uncommon thing in the smaller cities to see the automobile and electrical supply business run together, and it is likely that this will become more common as time goes on.

MERCURY-VAPOR LAMPS.

A scheme for rendering a mercury-vapor lamp self-starting on alternating current, as patented by Dr. C. P. Steinmetz on Jan. 11, is shown in Fig. 1. The lamp is provided with two auxiliary starting anodes, one of which is movable by means of a plunger electromagnet. This anode rests upon the mercury cathode when the lamp is idle, and is drawn upward out of contact when current passes through the magnet coil from the supply system. The arc formed between this anode and the cathode causes the upper main anodes to become active and current passes to them alternately according to the direction of the impressed e.m.f. Current in the reactive coils connected to the main anodes produces e.m.fs. which act at the auxiliary anodes in a direction to decrease the e.m.f. to the cathode and the arcs at these anodes are automatically extinguished.

In Fig. 2 is shown a combination of incandescent lamps with a mercury-vapor lamp patented by the same inventor on the same date. The ballast resistor for the mercury-vapor lamp are incandescent lamps of the metallic-filament type. These lamps



Figs. 1 and 2—Mercury Vapor Lamps.

add to the light certain rays not given from the mercury-vapor lamp, and thereby improve the illumination, as well as the efficiency.

SNAP SWITCHES FOR MOTOR CONTROL.

By Arthur Gillman.

In industrial plant installations all electrical wiring and bare current carrying parts should be totally enclosed. Frequently, conductors to a motor driving some machine are carried the entire distance from the source of electrical energy to the machine in wrought iron conduit. The wiring around the machine and controlling appliances is, however, installed without any enclosing protection, so that protection is omitted where most needed. This condition can be corrected by holding the manufacturer of the machine responsible for mounting the motor on it and for installing all wiring between the line switch for the motor and the motor itself. One large industrial concern always includes the following clause in specifications for its individually motor-driven machines:

"The manufacturer shall mount motor and all controlling appliances on machine in accordance with drawings or direc-

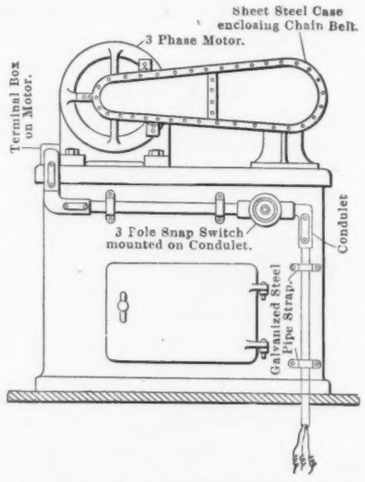

Sheet Steel Case enclosing Chain Belt.
3 Phase Motor.
Terminal Box on Motor.
3 Pole Snap Switch mounted on Conduit.
Conduit
Galvanized Steel Pipe Strap.

Fig. 1—Snap Switch Controlling Induction Motor.

tions from the Engineering Department, and shall install all wiring for the interconnection of said motor and controlling appliances. The entire equipment shall be shipped complete and ready for operation. It is understood that the purchaser is to install supply wiring as far as line switch on machine.

All wiring shall be totally enclosed in wrought iron conduit and conduits, and shall be installed in strict accordance with National Electrical Code requirements."

Manufacturers of motor-driven machinery will, unless specifically directed to do otherwise, mount only the motor on the machine and ship the controller or starter unmounted, leaving it to the purchaser to do the mounting and interconnecting. In good practice it is considered that the electrical controlling equipment and motor are as much a part of an individually driven machine as any gear or a bearing on it.

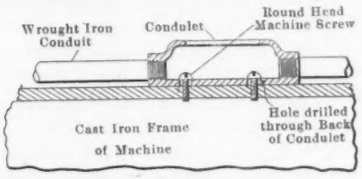


Fig. 2—Screws Through Condulet.

They should therefore be permanently mounted on the machine. If the machine is moved, motor, interconnecting wiring and control appliances move with it.

Enclosing covers for motor starters and enclosed drum and dial controllers are regularly manufactured by the best electrical concerns, but no company, so far as the writer is aware, can supply a fully enclosed knife switch of small capacity. Commercial snap switches, mounted on condulets, can be utilized to advantage where a fully enclosed switch of small capacity is required. These snap switches can be furnished in current-carrying capacities of 5, 10 and 20 amp, and are either single pole, double pole or three pole, as the purchaser may elect. Each switch is mounted on a porcelain base and has a nickeled metal, cup-shaped enclosing cover, insulated inside with a fiber lining. An insulating key of imitation rubber extends through the cover. The key has a rotary motion, and a quarter turn will either open or close the circuit, depending on its initial condition.

Fig. 1 illustrates the application of such a switch to a motor-driven machine. The motor is a small 3-phase, 220-volt, 60-cycle induction machine of the squirrel-cage type, and it is permanently mounted in accordance with the specification outlined above. The conduit and wiring, except that shown by the light line, was furnished on the machine by its manufacturer. The condulet elbow and portion of conduit indicated by the light line were installed by the purchaser. The company that built the motor will, when it is so specified, arrange its induction motors "for conduit wiring." That is, it

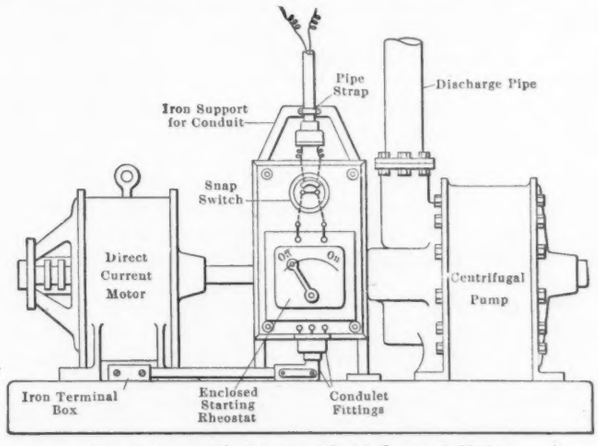


Fig. 3—Snap Switch for Direct-Current Motor.

will equip each motor with an iron terminal box, totally enclosing the motor terminals, having a hole drilled therein to receive the conduit. The motor shown was so arranged. The switch is of the snap indicating type and has three poles. Pipe straps are used to secure the conduit in position. Machine screws turning into tapped holes in the cast iron frame of the machine bind the pipe straps securely.

The switch is mounted on a cast iron condulet, and right-angle turns in the conduit run are made with condulet elbows. It is sometimes possible to secure conduit and fittings in position, without using pipe straps, by passing machine screws through holes drilled by the purchaser in the backs of condulet fittings as indicated in Fig. 2, which shows a section through a condulet so fastened.

No compensator or other starting device is used in connection with the application shown in Fig. 1 inasmuch as starting devices are not usually considered necessary for induction motors of less than 7½ hp output.

A snap switch used in connection with a starting rheostat and a direct-current motor driving a small centrifugal pump is delineated in Fig. 3. The switch is mounted on a black-slate panel, which also carries the enclosed starting rheostat. All wiring, except short sections cleated to the back of the panel, is carried in conduit, and the motor is provided with an iron terminal box drilled to receive the conduit. The equipment, including motor, pump, base, control panel and wiring, was furnished complete by the pump manufacturer. Upon its receipt the plant electrician had only to run the supply wiring and connect it to the switch terminals and the outfit was ready for electrical operation.

When ordering enclosed snap switches for motor control the indicating type should always be specified. An opening is provided in the cover of this type under which a dial carrying the legends "on" and "off" revolves. The appearance of one of the words under the opening indicates whether the circuit controlled is open or closed.

NEW TELEPHONE PATENTS.

LINE SIGNAL SYSTEM.

With comon battery exchanges it has been customary to connect one pole of the battery to one limb of the line, and the second battery terminal with the second line limb. The line signal or relay coils are sometimes cut in on one side and sometimes on both sides, so that when the normally open circuit is closed at the subscriber station, the signal will be displayed. Furthermore, the signal is only displayed so long as the circuit is closed. In a system patented by H. D. Stroud, of Chicago, both limbs of the line are connected to the same pole of the battery, the other pole being grounded. The circuit is completed over both by a momentary grounding at the station, after which the line relay locks itself in the operated position until the response of the operator. Another advantage claimed for this arrangement lies in the fact that the accidental grounding of either side of the line is recognized by the operator. Again, if one side is open, the subscriber may still signal even though not able to talk. Clicks are also reduced in volume. The patent is assigned to the Stroud International Measured Service Company.

NEW APPARATUS.

A gang party-line key forms the subject of a patent granted to Mr. B. E. Sweet, of Cleveland, Ohio, his patent being assigned to the Century Telephone Construction Company. There are several selective current key units of the push type and a master-key unit of the lever type mounted together. A rocking bar serves to lock the last push depressed and to release simultaneously all others. An extension from the locking bar bears against a spring of the lever key. If this key be operated the locking bar is caused to release all buttons.

Mr. W. E. McCormick, of Chicago, Ill., has obtained a patent for a transmitter of the inverted solid-back type. A ring of sheet metal is laid on the face of the diaphragm, ears from the ring project through perforations in the diaphragm. A spring member lies next behind the diaphragm, its center being gold-plated to form an electrode. The cell for carbon granules lies next and is held in position by the ears of the first-mentioned ring which are turned over its flanged edge. This holds the cell to the diaphragm, its rear being closed by the stationary

electrode and mica washer. The spring member has arms extending from its circular middle, which spring arms are arched back to rest in insulated sockets set in the bridge piece of the transmitter. These arms give an initial tension to the diaphragm and also act as dampers. The International Telephone Manufacturing Company has obtained the patent by assignment.

A switch for private-branch exchanges has been invented and patented by Mr. S. A. Koltonski, of Boston, Mass. This apparatus is for use with those exchanges where each station does its own switching. The feature lies in a combination of three key-lock plates. One serves to lock the trunk keys only; one, the branch-line keys only, and the third, acutuated by the hook lever, unlocks both sets of keys simultaneously. Thus, if a call arrives from the exchange and it is answered by the depression of the proper trunk key, this latter is locked down. When the call is extended to the proper branch line, the trunk key is not released, but the branch key is locked. When the branch line has answered and the receiver is therefore turned to the hook at the switching station, both sets of keys are released.

Letters to the Editor.

Long Life of Tungsten Lamps.

To the Editor of Electrical World:

Sir:—We are having, what we consider, a very remarkable test with a couple of 100-watt tungsten lamps. On Feb. 6, 1909, we installed one of the lamps in our engine-room about midway between the generator and the Corliss engine, and on Feb. 22, 1909, another was installed in our office. We do not have a day current, but up to date our recording voltmeter shows that the first-mentioned lamp has burned 4665 hours and 40 minutes, while that in the office has burned 4432 hours and 25 minutes. From all appearances the lamps give just as much light to-day as when first installed. We have had several cases where a tungsten lamp would drop in light efficiency between 1200 and 3000 hours usage, but we have never heard of a lamp burning over 4500 hours without any decrease in candle-power.

We would like to know if any of your readers has had an experience similar to this.

Basin, Wyo. J. E. Frisby,
Manager Wyoming Electric Light & Power Company.

Patent Reform.

To the Editor of Electrical World:

Sir:—The article by Mr. H. Ward Leonard, entitled "Patents Should Not Confer Monopolies," which appears in the issue of February 17, seems sure to create great interest, but as in the case of almost all discussions relating to the patent system, the article appears to lack in basic principles.

Now, invention is property, just as real estate is property. Witness the multitude of court decisions in patent cases. Therefore, any patent which is to lay true title to ownership of invention, to be legal and hold so, must fully meet the requirements of the rules and principles of law relating to titles of ownership.

First, that which is to be owned must be definitely set forth and made unquestionably known. Title to invention is in no case exempt from the hard and fast rules of law applying to titles of ownership. And just as a parcel of ground must be definitely disclosed before any valid title of ownership will issue upon it, so must invention be similarly disclosed as new before the courts, bound to the fixed rules of the law, can uphold title to it. Mere governmental fiat will not, does not, meet the requirements of jurisprudence.

Second, patentable invention should be definitely defined and disclosed under conditions producing effect which jurisprudence must accept; and it is clear that what is old in invention and liberal arts must be known before what is new shall be knowable as new. Only valid title can be granted to the new.

Furthermore, differing from realty, invention must be proved to exist, and any adequate patent system must provide means for establishing the fact of invention in a manner the law must accept. Otherwise the courts cannot hold that invention in a specific case does exist. The fact of invention must be truly established, and a form of bona fide title given to it. Both the proof of invention and the title granted it must be of a quality the courts can uphold.

What shall be done with the absolute title thus created in order to conserve the industrial and commercial interests is a question typified by the article you print. First, the thing to be controlled must exist. As the present system stands, it creates neither the fact of invention nor a legal patent title.

These are the two absolute, prime, fundamental requisites to a patent grant if it shall have operative equitable force. Unless a sound, legal issue of patent title shall be surely provided, when it comes up for adjudication the courts will be, as they are now, in duty bound to deny its validity notwithstanding statutes which, like the patent itself, must be adjudicated; for the courts will not uphold a statute not meeting the legal requirements. This is so apparent no citations need be here given in its support. A statute may elaborately define the maximum royalty the patentee shall exact, and go into the enumeration of a thousand details relative to the patent grant, yet all will surely be of no avail unless the patent itself—the thing to be controlled—shall possess a legal entity. Right here has been our principal weakness. We have surrounded a patent possessing no prima facie value with a web of law and procedure having no definite effect to establish a bona fide patent. The effect has been, and now is, exactly the contrary.

The fundamental, the essential, issue is a valid patent title—one that will stand in court. This is a great question. Once settled, what to do with it will be a comparatively simple matter to adjust equitably. Don't get the "cart before the horse." First get a real live horse. Then we can load the cart as seems best.

Enclosed is a draft of a bill submitted to the committee on patents of the United States Senate, and designed to put into effect the principles above sketched.

Newark, N. J. Chas. M. Haynes.

Section 1. That there shall be created in the Patent Office, a department to be known as a Bureau of Research and Disclosure, the function of which shall be to collect by all available means from all sources, with exceptions hereinafter provided, data, description, illustration, and all possible information and knowledge comprising and relating to all invention and operative elements of liberal arts known in the United States and jurisdiction thereof, and to analyze, classfy, consolidate and recapitulate, define, disclose and record the same; and to determine and ascribe to each element and to all known operative combinations of elements, a definite differentiating status in accordance with the rules and principles authentically established to define and characterize invention, and to record such status in a form of compilation that will be convenient for comprehensive reference so that the state of each art shall become fixed and known, preparatory to definitely determining that which is new invention when such shall be submitted for letters patent as provided by law, or for adjudication by the courts.

Sec. 2. That the records and considerations of the said bureau in the performance of the provisions of this act, shall not include or pertain to any invention or device disclosed by applications for letters patent which upon the date of this act, are, or which thereafter shall be pending any course of procedure lawfully within the Patent Office and not having become abandoned or otherwise lawfully nullified, and in the discretion of the examiners in chief, not having been submitted for action to the said office for the purpose of evading the said bureau; nor disclosures of invention contained in any operative caveat upon file in the Patent Office until after six years from the date of filing the original thereof, nor any letters patent in course of adjudication at court prior to final determination thereof, except upon order by a court of jurisdiction; nor invention or devices shown by the lawfully established rules pertinent thereto to be in course of diligent reduction to

practice prior to application for letters patent therefor; nor any invention or device which may be directly, indirectly, or in any manner voluntarily disclosed to the said bureau, its officers or agents, by whomsoever, when such voluntary disclosure shall be made independent of recorded request or direction by the said bureau, and in no case shall such voluntary disclosure have effect to preclude the granting of letters patent for such disclosed invention or device to any person otherwise entitled thereto by law; nor shall any invention or device disclosed by any structural specimen, description, illustration, or by any means whatsoever having origin foreign to the United States and entering the jurisdiction thereof subsequent to the first day of ————, 1910, enter the record or consideration of the said bureau.

Sec. 3. That there shall be a chief officer for the said Bureau of Research and Disclosure, appointed by the President, by and with the consent of the Senate; the said chief officer shall have independent responsible charge of the said bureau, and shall be accountable to and within the jurisdiction of the Secretary of the Interior. All other officers, clerks and employes hereinafter authorized for the said bureau, shall be appointed by the Secretary of the Interior upon nomination of the said chief officer for the said bureau. The said chief officer shall have unrestricted access to such files, records and contents of the Patent Office as may be required for the purposes of this act.

Sec. 4. That the Secretary of the Interior, the Commissioner of Patents, and the Examiners in Chief of the Patent Office, together with the chief officer of the said Bureau of Research and Disclosure after such chief officer shall have been confirmed, shall, in accordance with such procedure as they in joint conference, the Secretary of the Interior presiding, may elect, prescribe and adopt the form of organization for the said bureau and the rules of practice and operation relating thereto.

Sec. 5. That the salaries of persons engaged in the service of the Bureau of Research and Disclosure, together with all other necessary expenses accruing from the establishment and operation thereof and directly chargeable thereto, after such shall have been approved by the Secretary of the Interior, shall be payable out of the Treasury of the United States.

Sec. 6. That the Secretary of the Interior by the chief officer of the Bureau of Research and Disclosure, is hereby authorized to make requisition in due form upon all United States Courts, United States District Attorneys, and United States postmasters, all, or such of them as from time to time may become advisable, to render to the said bureau such assistance as may be required of them in the accomplishment of the purposes of this act, and the said courts, attorneys and postmasters, are hereby authorized and directed to act in accordance thereto.

Sec. 7. That the architect for the Patent Office building shall provide suitable rooms for the accommodation of the said Bureau of Research and Disclosure within the said building, or, with the approval of the Secretary of the Interior, the chief officer of the said bureau shall lease such rooms as may from time to time be necessary for the purpose.

[A recent writer on the subject of the patent situation discusses property right in inventions as follows:

"There is no natural right of property in an invention. * * * If an abstract invention were property to which the inventor had a natural right, then society ought to protect the owner perpetually in the possession of it; the limitations of his ownership to a few years would be monstrous injustice. But the very nature of an idea renders it incapable of exclusive possession except as it may be retained in secret. When it is once divulged, it may be possessed by any one, nor does the originator possess any less because the receiver of it possesses the whole. It is, therefore, very different from a pair of shoes, for example, which cannot be property of both the giver and receiver. * * * An exclusive right to an invention is a monopoly of the most absolute type. Such a monopoly destroys and curtails the natural right of others and is defensible only on the ground of public policy. Experience has established the wisdom of such monopoly grants, under proper restrictions, when they are confined *to the precise point in which the originality of the invention consists.* It is, therefore, highly essential to the welfare of the people that grants of patents be properly controlled by the people. Otherwise will follow annoying interference with individual rights and great waste of money in unproductive labor."—ED.]

Digest of Current Electrical Literature

ABSTRACTS OF THE IMPORTANT ARTICLES APPEARING IN THE ELECTRICAL PERIODICAL PRESS OF THE WORLD

Generators, Motors and Transformers.

Constant-Current Generators.—L. MONATH.—Train-lighting generators must give constant voltage within wide limits of speed variation. Search-light generators and electric-welding generators must give constant current independent of the voltage when changed from normal value to short-circuit voltage.

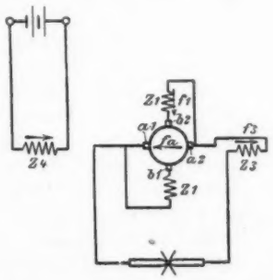


Fig. 1—Diagram Showing Principle of Train Lighting System.

In both types of generators this result is obtained by a regulation of the main field. For this reason a machine of the first type of generator can be modified so as to become a generator of the second type. The author shows how the train-lighting generator of Osnos, formerly described in the Digest, has been changed so as to give constant current. In Fig. 1 a_1 and a_2 are the main brushes of the machine and b_1 and b_2 the auxiliary brushes, z_3 the compensation winding through which the load current passes. A second excitation winding z_4 is supplied with current from an independent source, for instance, a battery. The main excitation winding z_1 is divided into two parts. The flux f_1 generated by it produces the main voltage between a_1 and a_2 during the rotation of the machine, while the armature flux, the flux of the compensation winding, and the flux of z_4 produce the voltage between the auxiliary brushes b_1 and b_2. The machine has a mixed excitation, being partly self-excited and partly separately excited. If the resistance of the load decreases and the current therefore increases, the counter e.m.f. increases. The main flux f_1 and hence, the voltage between a_1 and a_2, will therefore decrease so that a further increase of the load current is prevented. After describing the action of the machine in detail by means of diagrams, the author gives curves showing the results of experimental tests of the machine and its application in connection with search lanterns and for electric welding. The author then discusses the construction of a motor-generator in which direct current of constant voltage is changed into constant current of variable voltage. He then describes a single-armature rotary converter giving constant current (based on the same principles as the above generator) and gives the results of tests of this machine in diagrams.—*Elek. Zeit.*, Feb. 10.

Commutator.—A note on a recent (Brit.) patent for a radial

commutator granted to F. W. Le Tall (Westinghouse Electric Company, of this country; 19,393, 1909; Feb. 10., 1910). To prevent overheating at the working surfaces of radial commutators, sets of bars are assembled radially round a ribbed sleeve on the shaft so that passages are left between the several sets and the shaft. Similar bars of the several sets are connected by thin lugs so as to leave space for the air to pass up radially from the shaft along the working faces. A forced circulation is obtained due to the centrifugal effect.—Lond. *Elec. Eng'ing*, Feb. 17.

Energy Flow in Dynamos.—Count Baillehache.—The conclusion of his theoretical, illustrated article on the application of Pointing's theory of the flow of electromagnetic energy on the phenomena in dynamos.—*La Lumière Elec.*, Feb. 12.

Lamps and Lighting.

Glare.—An account of a discussion held before the Illuminating Engineering Society in London. A. P. Trotter expressed the opinion that sources of light within the range of vision should be eliminated, although he admitted that indirect illumination is rather an expensive matter, especially for domestic lighting. It is best for the intrinsic brilliancy not to exceed one candle per square inch, or thereabouts. The ordinary 16-cp metallic-filament lamp, he said, gives about 4.5 cp. per square inch, which is too bright, and such lamps should not be used without shades. He expressed the opinion that it is a mistake to measure the intrinsic brilliancy of a lamp by multiplying the length of the filament by its diameter and dividing the candle-power by the number of square inches thus obtained. W. R. Cooper said that he did not agree that glare depends simply upon intrinsic brilliancy. The question of contrast also comes in. The eye has difficulty in adapting itself to heavy contrasts between the source of light and its immediate surroundings. He regards the tendency to use metallic-filament lamps completely unshaded as a great mistake.—Lond. *Elec. Eng'ing*, Feb. 17.

Bremer Arc-Lamp Patent Valid in England.—In the British Appeal Court judgment has been given in the appeal of the British Westinghouse Company against the decision of Justice Joyce that the Bremer flame-arc lamp patent was invalid on the ground of want of subject matter. The Court of Appeals decided that the lamps sold by G. Braulik were an infringement of the Bremer patent, and also that the objections to the latter on the grounds of anticipation and want of subject matter failed. Therefore, the patent was restored, an injunction being granted against the sale of the infringing lamp, and also an inquiry as to damages, the latter being stayed for a month with a view to an appeal to the House of Lords.—Lond. *Elec. Eng'ing*, Feb. 17.

Generation, Transmission and Distribution.

Water-Power Plant.—An illustrated description of the water-power plant of the British Aluminium Company at Stangfjord in Norway. It was necessary to provide considerable storage of water, which was effected by the regulation of a chain of six lakes. There is a single water-turbine of 3000 hp, running at 300 r.p.m., and directly coupled to a pair of direct-current generators operated in parallel and designed to give 8000 amp at 275 volts.—Lond. *Electrician*, Feb. 18.

Water-Power Plant.—J. Liston.—A fully-illustrated description of the Johnsonville hydroelectric development of the Schenectady Power Company. The dam at Schaghticoke, together with that at Johnsonville, gives a total available storage capacity of 376,000,000 cu. ft., or sufficient to supply a flow of 250 cu. ft. per second continuously for a period of 20 days.—*Gen. Elec. Rev.*, March.

Gas-Power Plant.—The principal feature of the power station which has been put down for the electrical driving of the Great Western Railway Carriage and Wagon Works in Swindon is a pair of 250-hp suction gas producers, each supplying gas to a vertical four-cylinder engine. Electric motors are gradually being introduced throughout the works, which will ultimately be practically entirely electrically driven. Continuous current at 250 volts is employed, and overhead feeders are used.—Lond. *Elec. Eng'ing*, Feb. 17.

Mixed-Pressure Steam Turbines.—An article in which the limitations of small exhaust steam turbines are first noticed, as well as the drawbacks of connecting a live-steam turbine to exhaust into a low-pressure turbine. A description is then given of the "series-parallel steam turbine" of the Oerlikon Company, which avoids these disadvantages. The special feature of this turbine is that the exhaust or low-pressure steam works in two separate low-pressure turbine sections, one of which is directly connected in series with a high-pressure turbine the moment the machine is to run with live steam alone.—Lond. *Electrician*, Feb. 18.

Steam Turbine.—An illustrated description of the Dick, Kerr-Bergmann steam turbine which is of the impulse type with initial velocity stages.—Lond. *Elec. Eng'ing*, Feb. 17.

Planing-Machine Drive.—An illustrated description of a new method of planing-machine drive by reversing motors, introduced by a British company, which has considerable advantages over belt drive. The energy is supplied through a small motor-generator which enables a variable voltage to be applied to the main motor, and the control to be effected entirely on the generator field. Considerable economy of energy is obtained by regenerative action at the end of each stroke, and very high-cutting speeds are possible.—Lond. *Elec. Eng'ing*, Feb. 17.

Traction.

Electric Traction in the United States and Germany.—W. Fellenberg.—The conclusion of his long serial, illustrated by diagrams, giving a comparison of the development of the different branches of "heavy electrical engineering" in the United States and in Germany. In the last installment the author deals with street railways, elevated railways, and interurban railways and emphasizes their enormous development in the United States in comparison with which the development in Germany is rather insignificant. On the other hand, it is pointed out that it is a great deal safer to travel in Germany than in this country. While in 1906 an accident happened to one out of 2,000,000 passengers in Germany, an accident happened to one out of 123,000 passengers in the United States in 1902. In Germany one person was killed out of 8,000,000 in 1906; in the United States one out of 480,000 in 1902. It is, therefore, 16 times safer to travel in Germany than in the United States. As referred to car-kilometers the figures are as follows: An accident happened to one person per 39,000 car-kilometers in the United States and to one person per 580,000 car-kilometers in Germany; one person was killed per 1,520,000 car-kilometers in the United States and one person per 2,800,000 car-kilometers in Germany. In the United States the elevated railroads are by far the safest; then follow horse cars, while most accidents happen with electric street railways.—*Elek. Zeit.*, Feb. 17.

Charge for Tramway Supply from Lighting Stations.—An account of the discussion which followed the recent paper of Mr. H. E. Yerbury, in which he criticized the usual methods of allocating the relative proportions of generating costs in combined lighting, industrial service and tramway stations. In the discussion the majority of the speakers disagreed with the author and thought that in most circumstances it was perfectly fair to charge large motor users a lower rate than tramways. Mr. H. Richardson pointed out that the conditions differed between traction and stationary motor consumers. In spite of the shorter hours, large motor users have a better load-factor than tramways with their large variations of load, and are often considerably cheaper to handle. Moreover, the occasional coincidence of the tramway and lighting peaks must be allowed for.—Lond. *Elec. Eng'ing*, Feb. 17.

Installations, Systems and Appliances.

German Electrical Industries in 1909.—R. Buerner.—Statistical data on the condition of the various electrical industries in Germany during the past year. As to the employment of workingmen the following figures are given from 14 insurance

companies for workingmen in the electrical industries, showing the number of men and women employed during the last three years:

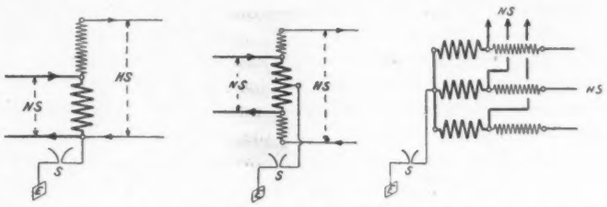
1907	37,766 men	and 6739 women
1908	37,088 men	and 7188 women
1909	37,227 men	and 8002 women

The large increase of women employees is due chiefly to the increase in the manufacture of metallic-filament lamps. The total number of working men and women in the electrical industries in Germany in 1898 was 54,000, while the same number for 1909 is estimated as 125,000. As to the profits obtained in the electrical industries reference is made to the fact that two of the large Berlin companies paid a higher dividend than the year before, but the case is very different with the 250 and 300 German electrical concerns of smaller size. The bitterness of the fight between the large companies and the small and medium concerns has never been so strong as in the last year. The prices of the electrical products have decreased on the average during the last year by 10 per cent, although they had already decreased the year before and although the prices of raw materials had not decreased essentially. As to the manufacture of dynamo-electric machinery and transformers, considerable orders were received from mines and metallurgical works, and from new central stations distributing energy over considerable agricultural districts; the demand for dynamo-electric machinery from electrochemical and electric steel-furnace plants has also increased. The situation in the cable and insulated wire line was unsatisfactory from a financial respect. The cable syndicate was dissolved in the beginning of the year and prices then dropped below cost. The syndicate was formed again on May 4, but the prices could not be restored to the former height. Arc lamps have met with considerable competition from metallic filaments; the smaller types of arc lamps have lost a considerable field of application, probably forever, to large candle-power metallic-filament lamps. On the other hand, the large arc lamps will maintain their market. The incandescent-lamp industry was very successful, especially on account of the increased demand for metallic-filament lamps, in which rapid technical progress has been made. The exports of incandescent lamps from Germany amounted to $9,000,000 during the last year against $5,000,000 in the year before; the metallic-filament lamps represented from 50 to 60 per cent of the export. The manufacture of carbon-filament lamps was about the same as before. The market for electromedical and electrotherapeutical appliances has been good, while the concerns making telegraph, telephone and signal apparatus had to reduce considerably their operations. A table is given of the exports of electrical machinery appliances and apparatus from Germany. They amounted to $50,510,000 in 1908 and $50,415,000 in 1909. As to the development of the central stations in Germany the following table is given:

Year.	No. of stations.	No. of incandescent lamps.	No. of arc lamps.	Hp of motors (except traction.)	Total connections in kw.
1895	148	493,801	12,357	5,635	35,941
1900	652	2,623,893	50,070	106,368	251,961
1905	1,175	6,301,718	121,912	310,428	655,437
1907	1,530	9,736,763	178,912	582,862	1,100,861
1909	1,978	12,808,351	234,566	892,910	1,872,592

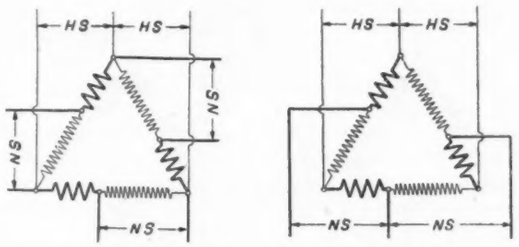
The central stations in Germany represented a total invested capital of $305,000,000.—*Elek. Zeit.*, Feb. 17.

Autotransformers.—Since in an autotransformer the voltage of the low-tension circuit against earth may be raised to that of the high-tension circuit, it is necessary to observe certain precautions. With single-phase autotransformers one terminal of the low-tension and high-tension circuits may be connected to earth, as shown in Fig. 2, or the middle point of the low-tension winding may be connected to earth, as shown in Fig. 3. *NS* represents the low-tension coil, *HS* the high-tension coil. Such connections to earth in single-phase plants should be made after careful consideration of the conditions of each case. With three-phase transformers having star connection, the common neutral point may be connected in all cases to earth, as shown in Fig. 4. If the earth connection is made with an insertion of a lightning arrester this must be adjusted in such a way that it operates as soon as the voltage between the pole of the low-tension coil and earth increases beyond the normal value by a certain amount, say, 40 per cent. The use of autotransformers has considerable advantages in the dimensions of the windings required. The use of autotransformers



Figs. 2, 3 and 4—Diagrams of Autotransformer Circuits.

is especially recommended to replace ordinary three-phase transformers with star connections, with an earthed neutral point and a small transformation ratio. In Fig. 5 and Fig. 6 are shown two special connections for three-phase transformers in which the advantages of transformers with primary and



Figs. 5 and 6—Autotransformer Circuits.

secondary delta connections are combined with those of autotransformers. The primary and secondary coils of each phase are connected in series, the phase windings being connected in delta. Fig. 5 is intended for a six-wire network and Fig. 6 for a three-wire network on the low-tension side. A transformer connected in this way compensates to a certain degree for the lack of symmetry of voltages caused by an unbalanced secondary load and may, therefore, be called a self-compensating autotransformer. In the last diagram the transformer ratio cannot be more than 2 to 1. In this case there is also a phase difference between the primary and secondary voltage which depends on the transformation ratio. Special forms of autotransformers are arc-lamp transformers, voltage divisors, step transformers for starting squirrel-cage induction motors, etc.—*Period. Mitteil.*, Oerlikon Company, No. 54; *Elek. Zeit.*, Feb. 17.

Balancers for Three-Wire Systems.—A. G. COOPER.—A paper read before the Manchester Section of the (Brit.) Inst. Elec. Eng. The author first reviewed the principles of the ordinary continuous-current balancer, which usually consists of two shunt machines mechanically coupled together, with their shunts cross-connected, and of such size that they are capable of carrying continuously a little more than half the observed out-of-balance current. Reference was made to some tests of a set of this kind which gave a voltage regulation within 3 per cent at full load. An improvement on this figure of 3 per cent could be obtained by putting on some series turns to compensate for the armature drop, but to get the best effect and to avoid other complications in case of a heavy short-circuit these coils should be cross-connected. By over-compensating the armature drop by additional series turns the out-of-balance side can be even raised above the opposite side. Another form of balancer is a machine with a single shunt field winding connected across one of the outer wires and the middle wire. This machine has a double-wound armature with a commutator at each end, but is rather a poor balancer, and really only a middle-wire former. The latter part of the paper was devoted to the so-called "static" balancers, the use of which in England has mostly been in connection with rotary and motor-converter installations,

by making use of the secondary coils of the transformer, connecting the middle wire of the system to the star-point of the secondary coils of the transformers which are supplying energy to the converters. This has been shown to be bad from an efficiency point of view. It is better to have a separate static balancer than to use the secondary coils. The static balancer consists of a choking coil with only one winding on each limb, according to the number of phases used. The terminals are connected to equally-spaced connections round the armature of the dynamo to give the selected phase proposed to be used. From the slip-rings is obtained an alternating e.m.f. which is impressed upon the terminals of the choking coil while the star-point is connected to the middle wire. When the system is balanced, there will be a strong choking action which will prevent any large flow of alternating current from the slip-rings. When an out-of-balance current flows through the balancer and the armature, there will be a drop in volts due to the resistance, but this is practically no greater than in most balancers, if the static balancer is suitably designed. The greater the number of phases, the better is the regulation. Various balancing arrangements were described in the discussion. Mr. S. J. Watson considered that the best form of balancer for a generating station is a battery divided into two parts across the three-wire system left continuously on the mains.—Lond. *Elec. Eng'ing*, Feb. 17.

Starting Autotransformers.—E. F. Gehrkens.—An illustrated article on the principles and construction of starting autotransformers for squirrel-cage induction motors. The author thinks that there is no practical value in starting a motor by means of a multi-step autotransformer instead of a single-step autotransformer except in a few special cases.—*Gen. Elec. Rev.*, March.

Paris Flood.—A continuation of the description of the damage done to electrical installations in Paris by the recent flood. The author deals with the St. Denis station, the transmission line from Invalides to Versailles and the Issy-les-Moulineaux station. The article is to be continued.—*La Lumière Elec.*, Feb. 12.

Wires, Wiring and Conduits.

Losses from Direct-Current Transmission Lines.—An account of the discussion which followed the presentation of the recent paper of E. A. Watson on losses of direct-current transmission lines due to brush discharge. J. S. Highfield gave some data which he had received from Thury from actual practice with high-tension, direct-current transmission lines. Concerning the actual losses over a line having a length of 181 km—360 km of wire 9 mm in diameter—and which worked at a constant pressure of from 50,000 to 60,000 volts, he stated that the loss on that line was found to be negligible. On another line some 30 miles long, and having 3000 insulators, a machine capable of giving 0.1 amp and 20,000 volts could keep the line fully charged at this pressure. J. S. S. Cooper stated that the corona presents a commercial rather than a technical difficulty. So far as is known it can be avoided for any voltage by sufficiently increasing the outside diameter of the conductor. If it proves worth while, copper tubing can be substituted for a solid copper conductor. It is possible that the limits imposed by the corona might prove to be a considerable factor in the choice between copper and aluminum transmission lines, the latter having, for a given resistance per mile, a 30 per cent larger diameter than copper. In the tests made by Mershon at Niagara, the loss was found to be greater for an aluminum wire than for a copper wire of the same diameter. This fact does not necessarily prove that the effect has a chemical factor, but it may be due to the difference in the texture of the surface of these two metals. It is well known that some metals, including zinc, are capable of producing ionization under the action of daylight. It would be important to decide by conclusive tests whether there is any practical difference between different common metals as regards critical voltage and brush-discharge losses. H. M. Hobart claimed that the great point formerly raised in favor of the Thury system in comparison with alternating-current transmission was that the ratio of the possible transmission voltage is 2 to 1. He stated that it now appears that it is only 1.4 to 1.0. He considers that the question of how to transmit electricity to a distance to the greatest advantage is one of great importance, and his own opinion is that the alternating system is superior in so very many respects, as regards its appropriateness for high-pressure transmission, as to preclude the use of the continuous systems in all but very special cases.—Lond. *Electrician*, Feb. 18.

Concrete Poles.—A note on a new type of reinforced concrete poles recently designed by the Société Bresciana Cementi e Costruzione de Brescia and used on the tramway between Mestre and Trevisa. It is lozenge-shaped in section, the curves of the lozenge being concave. The core consists of eight iron rods at the base and four at the top of the pole. These poles carry a 10-mm trolley wire and three 4-mm wires, the span being 40 m. This arrangement gives rise to the following stresses, the wires being supposed subjected to a wind pressure of 70 kg per square meter operating on a cylindrical surface 6.4 meters above the section considered. Force, due to the weight of trolley wire, 61.6 kg; force, due to the wind pressure on the wires, 394 kg; force, due to wind pressure on the poles, 344.4 kg; adding 25 per cent (200 kg) for curves, etc., makes a total pressure of 1000 kg at the base—that is, 161.3 kg applied at a point 6.4 m above ground.—Lond. *Electrician*, Feb. 18.

Electrophysics and Magnetism.

Iron-Silicon Alloys.—C. F. Burgess and J. Aston.—An account of an experimental investigation of the magnetic and electric properties of iron-silicon alloys. These alloys were made from pure electrolytic iron free from carbon. The addition of silicon has a double effect; it improves the magnetic qualities and it increases the electric resistivity, both being advantages for transformer steels. It is not likely that the influence of silicon is directly, or in a strict chemical sense, the cause of the marked improvement of magnetic quality. It is more likely that the effect is due indirectly to some change in the physical structure of the iron itself. Magnetization curves are given of iron-silicon alloys unannealed, annealed at 675 deg. and 1000 deg. (and quenched at 900 deg.); moreover, there is given a curve of the change of resistivity with the content of silicon. Comparisons are made between the properties of these very pure alloys and with those of silicon transformer steels.—*Met. and Chem. Eng'ing*, March.

Magnetic Properties of Electrolytic Iron.—E. W. Terry.—An account of an experimental investigation of the effect of temperature on the magnetic properties of pure iron free from carbon prepared by the electrolytic process of Burgess. The chief results are as follows: Freshly prepared iron is very hard magnetically. Different samples show marked dissimilarities at low fields which disappear upon annealing at 1000 deg. C. For large fields, all samples are quite similar. Plunging into liquid air produces no permanent hardening. The retentivity has a maximum in the neighborhood of room temperature. Marked softening magnetically occurs at the hydrogen transformation points. Ferro-magnetism reappears on cooling at the same temperature at which it disappears on heating; this temperature is 785 deg. C. The best temperature for annealing is 1100 deg. C. Although when properly annealed it has a lower coercive force and a higher maximum permeability than has Swedish iron, its high retentivity causes a large hysteresis loss.—*Phys. Rev.*, February.

Temperature Coefficient of Electric Resistance of Nickel, Nichrome, Molybdenum and Tungsten.—A. A. Somerville.—An abstract of a Physical Society paper. The range of temperature through which the work of the author extends is from 0 deg. C to about 1060 deg. C.; limits well within the range of the platinum resistance thermometer. Four materials have been studied—nickel and nichrome (two good electric-furnace wires, inasmuch as they do not oxidize readily), and tungsten and molybdenum, which must be protected from oxygen when heated. The nickel and nichrome curves are very similar in shape, but the coefficient of the former is 20 times

that of the latter. The coefficients in either case are relatively small, between 400 deg. C. and 1000 deg. C., as compared with the coefficients outside these limits. The tungsten and molybdenum curves are slightly convex toward the temperature axis. The coefficients are large—1 ohm of molybdenum at 0 deg. C. measuring 5.7 ohms at 1000 deg. C. and 1 ohm of tungsten at 0 deg. C. measuring 6.9 ohms at 1000 deg. C.—*Phys. Rev.*, February.

Electrochemistry and Batteries.

Ferrosilicon.—S. M. COPEMAN, S. R. BENNETT AND H. W. HAKE.—A long illustrated article on the manufacture and transport of ferrosilicon. From a visit to several French ferrosilicon works data are given on the composition of charge, its proportioning, electric furnace construction, and process of manufacture. As to the evolution of dangerous gases from ferrosilicon it is stated that if calcium phosphate and calcium arsenide are impurities in the ferrosilicon (resulting from impurities in the charge), they may form very dangerous gases in contact with water or moist air. Data are then given on specific gravity and hardness of different grades of ferrosilicon. Finally, recommendations are made on the transport and storage of ferrosilicon.—*Met. and Chem. Eng'ing*, March.

Electrolytic Amalgamation.—With reference to a recent patent of Alling for an electrolytic amalgamation process in which the mercury is made the cathode of an electrolytic cell, the probable rationale of the process is discussed. One effect is that the mercury surface is always kept in a clean and perfect condition. A second effect is that direct cathodic reduction of telluride gold ore particles is made possible. A third effect is that gold particles may be dissolved in the electrolyte and afterwards deposited upon the cathode.—*Met. and Chem. Eng'ing*, March.

Electrode Losses.—C. HERING.—An illustrated article discussing the effect which the variation of the thermal and electric conductivities of the electrode material with temperature has on the electrode loss. A rising electric resistivity and a falling thermal conductivity are desirable features. A falling electric resistivity and a rising thermal conductivity are undesirable. For iron the electric resistivity rises and the thermal conductivity falls with rising temperature, hence in both respects the effect is favorable. With carbon the electric resistivity falls and the thermal conductivity rises with rising temperatures. Hence, both features are in the undesirable direction. With graphite, the electric resistivity falls and the thermal conductivity also falls with rising temperature, hence the two effects oppose each other, but the combined effect is a favorable one. The author also makes some remarks on thermal insulation.—*Met. and Chem. Eng'ing*, March.

Units, Measurements and Instruments.

Double Oscillograph.—G. SARTORI.—F. Piola has formerly described a double oscillograph in which two alternating waves are geometrically combined. The present author uses two oscillographs independent of each other. The axis of one is perpendicular to that of the other. The two oscillographs are placed in two parallel places. In order to combine the movements of the vibrating coils of the two oscillographs it is possible to provide each with a mirror and to accomplish by an optical method the geometrical combination of the two rays reflected from the two mirrors. The author uses only one mirror, which is connected by fine silk wires to the two vibrating coils. The application of this double oscillograph for direct demonstration of hysteresis curves is discussed.—*La Lumière Elec.*, Feb. 12.

Wehnelt Interrupter.—K. T. COMPTON.—The author gives first the results of an extended investigation of the action of the Wehnelt interrupter, frequency of interruption, influence of temperature and capacity, the action of interrupters in parallel, the action of the interrupter with alternating currents, and the nature of the light surrounding the anode. He then formulates the following theory of the action of the Wehnelt interrupter. The electrolyte immediately surrounding the wire anode is vaporized, not by the heat developed in overcoming the ohmic resistance of the platinum, but in overcoming the transitional resistance between the wire and the liquid and the resistance of the electrolyte very close to the point. This great resistance increases the amount of heat evolved for the instant, a portion of the vapor is dissociated into O and H, and thus an insulating sheath of an explosive mixture is formed around the point, thereby stopping the current. This gaseous sheath is the dielectric, and the point and the liquid are the plates of an electrolytic condenser. This condenser is charged with electricity given back to the circuit at the break by the inductive coil, and, as its capacity is small, its potential will be high enough to break down the dielectric by a spark, thus exploding the gaseous mixture and driving away the remaining gas from around the point and permitting the liquid again to make contact.—*Phys. Rev.*, February.

Measuring Permeability.—R. BEATTIE AND H. GERRARD.—A paper in which the authors describe experiments with Kapp's apparatus for measuring the permeability of iron under high magnetizing forces, and show that their results do not support those of E. A. Watson. It is found that the magnetizing force in such cases cannot be calculated from the ampere-turns per unit length of test piece, but must be measured. This the authors effect by a double exploring coil on the test piece, the coils being connected up differentially. When this is done the results agree with those obtained on rings. A B-H curve is given of a very high-grade sample of armature iron.—Lond. *Electrician*, Feb. 18.

Commercial Electric Testing.—E. F. COLLINS.—In the present installment of his long serial the author deals with commutating-pole generators, commutating-pole motors and direct-current series and railway motors.—*Gen. Elec. Rev.*, March.

Meter.—An official Reichsanstalt communication by which a magnet motor meter for direct curent of the Isaria Company is admitted for calibration. The construction, principle of operation, and method of calibration are described.—*Elek. Zeit.*, Feb. 17.

Telegraphy, Telephony and Signals.

Impact Excitation.—M. WIEN.—A preliminary note on a new form of impact excitation (Strosserregung) of electric oscillations. Geissler tubes are used on account of the great damping effect which they produce, but they are not employed as the air-gap proper, but only as a damping resistance, while the potential difference is obtained by an ordinary air-gap.—*Phys. Zeit.*, Feb. 1.

Ocean Cable Telephony.—K. W. WAGNER.—The first part of a paper contributed by the German Telegraph Experiment Station on the prospects of telephony and high-speed telegraphy over ocean cables. The author discusses the fundamental mathematical principles of the problem. The paper is to be concluded.—*Elek. Zeit.*, Feb. 17.

Electric Time Service.—F. HOPE-JONES.—An illustrated paper read before the (Brit.) Inst. of Elec. Engineers. The author discusses circuits of electrically propelled dials, describing the systems of Lowne, Aron, Perret, Magneta and Gent, which were introduced about 1905, as well as the "synchronome" system referred to in the author's paper some 10 years ago. Oscillograph records of the impulses transmitted under various conditions are given. Finally, reference is made to Bowell's and Murday's systems which have appeared since 1905.—Lond. *Electrician*, Feb. 18.

Miscellaneous.

Protection from Lightning.—OLIVER LODGE.—An abstract of a lecture before the University Engineering Society of Birmingham. The problem of protection from lightning is to find the best method of dissipating the enormous energy contained in a lightning flash. It is not wise to get rid of the energy too quickly. From an electrical point of view, a thin iron wire is the best lightning conductor, although sometimes there is not time for a poor conductor to discharge the flash. Lightning flashes are oscillatory; the ohmic resistance of the conductor is unimportant, but the impedance due to self-induction is very great. There are two kinds of flash—one the simple direct

discharge between an electrically charged cloud and earth, and the other an induced charge, as when a cloud intervenes between the cloud carrying the primary charge and the earth, the two clouds practically forming a condenser. When a discharge takes place from the first into the second, the charge on the earth side of the lower cloud is suddenly relieved, and the disruptive discharge from the latter to the earth may take such an erratic course that it is almost impossible to guarantee protection by lightning conductors unless the building to be protected is completely enveloped in a metal cage. To envelop buildings as far as is reasonably practicable in this manner is what should be aimed at, and it is quite wrong to suppose that a conductor placed on the tallest part of a building will render it immune from lightning.—Lond. *Elec. Eng'ing*, Feb. 17.

New Apparatus and Appliances

HORIZONTAL IMPULSE TURBINE.

The accompanying illustrations show the details of the Bergmann turbine built by Dick, Kerr & Company, Ltd., London, England. These machines are of the impulse type, and, according to the requirements of the case, from 5 to 15 pressure stages or chambers are employed, within which the same number of wheels revolve. In the first chamber the principle of velocity stages is employed, which makes it possible to utilize economically high steam velocity, and thereby also large difference in pressure at the usual peripheral speeds of an impulse turbine. Owing to the conversion of a large fall of pressure in the first stage, high pressures and temperatures are kept away from the turbine body, and the sealing of the turbine from the atmosphere and between the stages becomes quite simple. There are large clearances between the fixed and rotating parts, so that safety of operation is assured, and despite the fact that the moderate peripheral speeds of a normal impulse turbine are used, the number of stages is small. The turbine, moreover, is short, and the weight of the parts to be lifted, especially that of the rotor, is very light. The special and often complicated arrangements necessary to deal with the axial thrust of a reaction turbine are not required because there is no axial thrust.

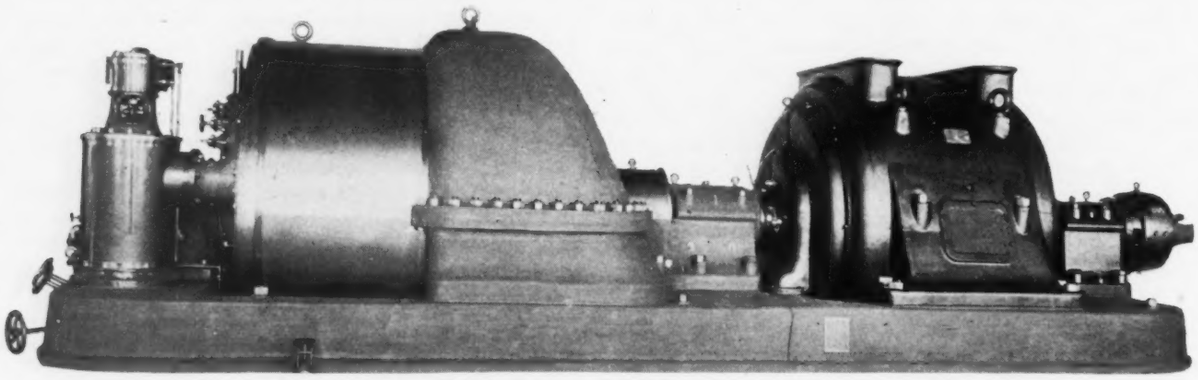
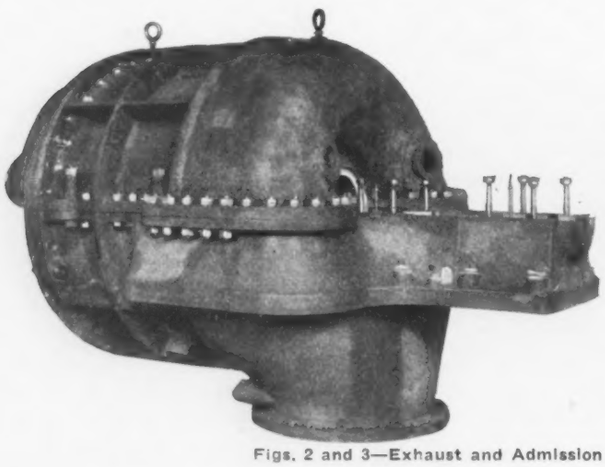
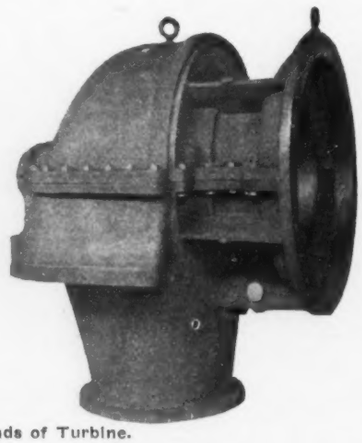


Fig. 1—6000-hp Turbine Direct-Connected to 4800-kva Alternator.

Up to the largest sizes, the body of the turbine consists of a single cast-iron cylinder, split horizontally in the center. At the admission end the cylinder is closed by a cover in one piece, which in the case of the smaller sizes of machines is made of cast iron and in the larger machines of cast steel. No special cover is required on the exhaust end. The supporting of the body has been arranged so that there is comparatively little expansion through heat, and at the same time the desired clearance is maintained when the plant is warm. Figs. 2 and 3 show the exhaust and admission ends of the turbine, respectively. The body is held freely on the support, which surrounds the vacuum end of the lower cylinder and the exhaust flange. This pedestal bears the entire weight of the cylinder, and is at the same time a support to the turbine and generator bearings. A special pedestal support at the high-pressure end of the body is unnecessary. The outer bearing pedestal is provided with a flange bolted to the end cover, near the center, so as to insure





Figs. 2 and 3—Exhaust and Admission Ends of Turbine.

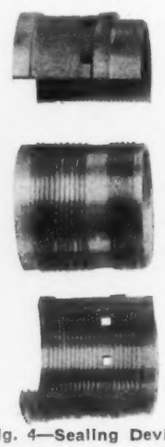


Fig. 4—Sealing Device.

correct alignment, and at the same time offer no resistance to expansion. This end-bearing pedestal also carries the governor, oil pump and guide block, and is shown in Fig. 5.

The joints of the cylinder are scraped to an accurate surface, so that a steam-tight joint is obtained without packing. The interior of the cylinder is divided by diaphragms into a number of chambers, and inasmuch as these diaphragms carry guide blades they are called guide wheels. The latter are fixed in the cylinder, which is grooved to receive them. They are built in two halves, with an annular space in the middle, through which the turbine shaft passes. At this point special sealing rings of white metal are fixed, which enclose the shaft without rubbing, and are provided with grooves to reduce the steam leakage between the neighboring chambers to the minimum.

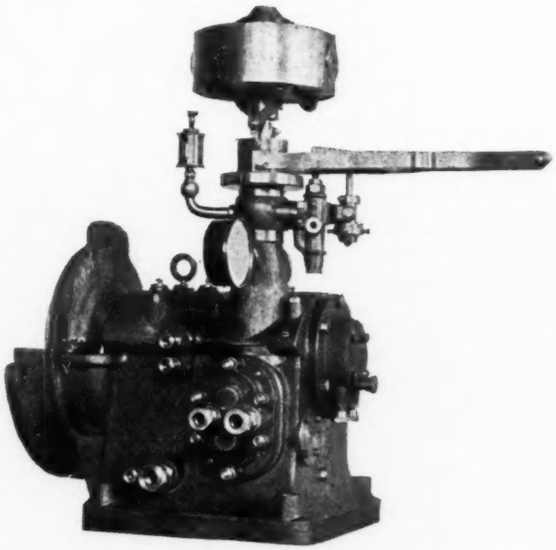


Fig. 5—End Bearing Pedestal with Governor, Pump and Guide Block.

The adoption of the principle of velocity stages for the first chamber makes it possible for the steam to expand in the first set of guide vanes from the working pressure down to a pressure of from 15 lb. to 45 lb. This pressure obtains throughout the first chamber, so that it is only necessary to provide a seal here. A labyrinth device is employed for this purpose, and is shown in detail in Fig. 4. The central part, which is provided with a series of rings, is mounted so as to be quite steam tight on the turbine shaft and rotates with it. The second part, shown in halves, is fixed to the turbine body and has similar rings which fill the space between the rings on the center part. There is a small air-gap between the two parts through which the steam is allowed to flow. The rings are arranged in two sets with a flat space between them, and the space thus formed is connected to the same portion of a similar sealing device at the condenser end of the turbine. The suction of the condenser draws the steam from the high-pressure seal to the low-pressure seal, and thence into the condenser. By an arrangement of valves fresh steam can also be admitted to the sealing devices, whereby the connection of the condenser can be throttled or completely cut off. The flow of steam from the sealing device into the condenser naturally influences the steam consumption of the turbine, but the almost frictionless construction thus obtained is said to be sufficient compensation for the loss of steam.

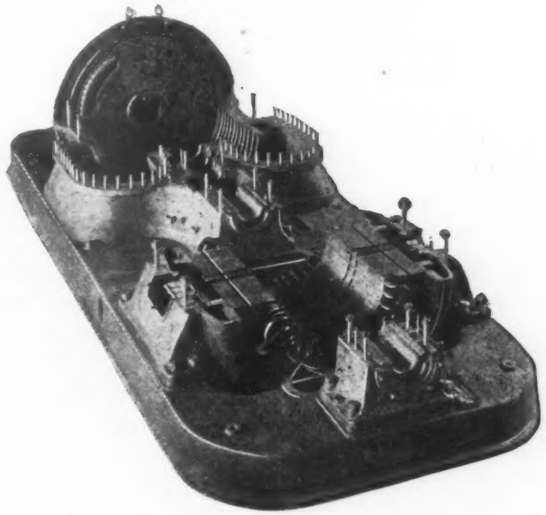


Fig. 6—Lower Half of Turbine Showing Admission Nozzles on End Cover.

The physical conditions which govern the expansion of steam in the first set of guide blades necessitate nozzles, the section of which increases from the narrowest part to the end. From 10 to 20 such nozzles are placed together and form a nozzle segment, and this latter forms the first set of guide blades, which is set immediately behind the throttle valve and regulates the admission to the velocity wheel. This segment is made of bronze, and is fastened to a casting of steel so as to be quite steam tight. The casting has a flange for connection to the high-pressure steam supply, and there are two handles for operating two valves, by means of which a certain number of the nozzles in the segment can be opened and closed, thus regulating the area of the steam passage. In the larger types the handles operating the valves are carried forward in front of the throttle valve and governor, so as to be clear of the parts which are mounted on the end cover. A suitable opening is made in the end cover to carry the complete inlet apparatus. In Fig. 6, which shows a lower half of the turbine cylinder, the end cover, together with a nozzle segment in position, is shown.

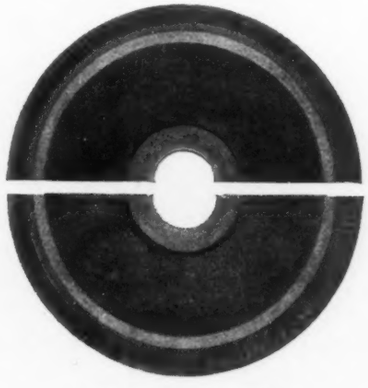


Fig. 7—Guide Wheel.

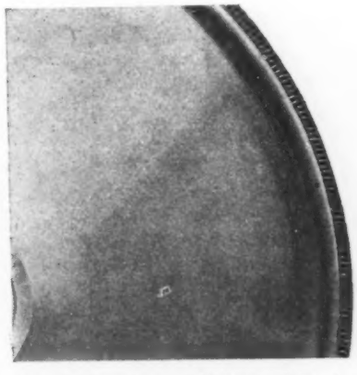


Fig. 8—Segment of Velocity Wheel.

The guide blades for the remaining stages are of a much

simpler construction. The steam channels have the same section throughout their length, and are made of vanes of sheet nickel cast into an iron ring which forms the periphery of the guide wheel. The first stage and the following two or three pressure stages have partial admission, and the remaining stages have all-round admission. The guide wheels are in halves fitted together with a steam-tight joint. A guide wheel for all-round admission is shown in Fig. 7.

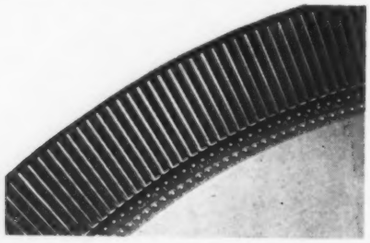


Fig. 9—Segment of Low-Pressure Wheel.

The rotating wheels of all stages are complete disks of Siemens-Martin steel. They are cast with a thickened hub bored to provide a firm seating on the shaft. The first wheel, which is of the design characteristic of a wheel of uniform strength, is provided with a bulb-shaped rim in which two slots are turned to carry two series of blades. The slots are dovetailed to fit the base of the blades, which are composed of special nickel steel. The high steam velocity in the first stages necessitates a channel of constant area in order to avoid wasteful steam eddies. This is attained by the blades having a special profile, but in the normal pressure stages this channel is not required. A segment of the velocity wheel, with blading complete, is shown in Fig. 8. The ends of the blades are closed by means of a band, whose function is to form a confined passage. No forces act upon the band except the centrifugal force due to its own weight. Fig. 9 shows a view of the blading of a low-pressure wheel. A band similar to that used for the velocity wheel is carried on the ends of the blades as shown, and after completion the wheels are balanced separately and tested mechanically by running them at a speed corresponding to twice the normal strains. Fig. 10 shows an assembled rotor.

The bearings which support the shaft are provided with water-cooled, oil-pressure lubrication. Oil rings and dividing partitions seal the bearings from the interior of the turbine, so that oil is excluded from the latter and the condensation can be employed for boiler feeding without preparation. A small geared pump, which is driven direct from the turbine shaft, keeps the oil in circulation under a pressure of from 15 lb. to 30 lb. per square inch. After passing through the whole length of the bearings the oil is pumped to an oil reservoir, where it is cleaned and simultaneously cooled.

The turbines are usually direct-connected to electric generators, and both machines being made in the same factory, the unit is designed as a whole. In the smaller units three bearings permit a rigid coupling between the generator and the turbine shaft. In the larger units four bearings are provided, two for the turbine and two for the generator. In this case a flexible coupling is used, consisting of a number of fine steel wires, which allow for any small inaccuracies in the alignment of the shafts and insure quiet running when it is in active service.

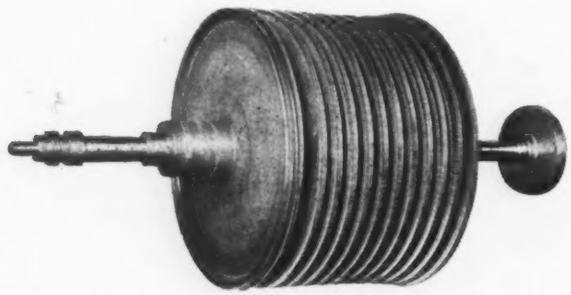


Fig. 10—Rotor for High-Pressure Turbine.

The governor is spring controlled and of the "Hartung" type. It is driven by means of a worm from the turbine shaft, and controls, by means of a connecting rod, a guide valve, which directs the flow of the pressure oil into one of two channels. From here the oil passes through into the top or bottom of the cylinder and moves the piston accordingly. The piston rod is direct-connected with the throttle valve on the steam supply, so that the latter follows the pressure exerted on the piston by the oil. The operation of the governor is rapid and lasts but a few seconds. It is, moreover, entirely independent of the pressure of the steam supply, so that it is possible to run the turbine without adjustment with a steam pressure which is much less than normal. To avoid a great increase in the relative steam consumption at light loads, a second method of governing is provided for the high-pressure turbines. The first set of guide blades is divided into several groups, each of which is controlled by means of a hand-operated valve. The single valves can be opened and closed according to the load, and thereby the admission to the first wheel so chosen to obtain the minimum steam consumption. As soon as normal speed is raised more than 10 per cent a safety device closes the steam inlet valve. The exhaust outlet is made of exceptionally large dimensions in order to reduce the pressure drop between the rotor and condenser to the lowest possible figure.

PANEL CUT-OUTS WITH SPOOL HANDLES.

The Trumbull Electric Manufacturing Company, of Plainville, Conn., has brought out a line of panel cut-outs in which the switches are equipped with spool handles and special blades which fasten in the ends of the handle in a groove, so that it is impossible for the handle to turn on the blade. The blades and handles are similar to those used on the company's panel-board switches. The illustrations herewith show the cut-outs thus equipped and also illustrate the use of the copper strap and copper lugs recently devised by the company for use in connection with panel or plug cut-outs. The use of the bus-bars saves much time and makes a very elastic and inexpensive substitute of cut-outs for panel boards. They are made of copper and are rated to carry 15 amp on the basis of 1000 amp per square inch of copper. For greater current-carrying capacity they can be placed one on top of the other. The lugs are also of copper and can be adjusted to fit different sizes of wire. By the employment of these devices, time is saved in baring wires under fastening clamps and the lugs can be used on single or double branch cut-outs where common wire clamps are too small.

Fig. 1—Cutout for Vertical Mains.

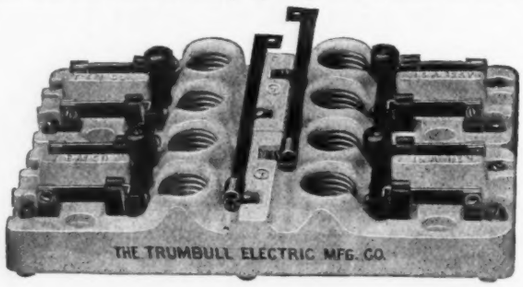


Fig. 2—Cutout with Busbars and Lugs.

BOSTON AUTOMOBILE SHOW.

The eighth annual Automobile Show, at Boston, which opened in the Mechanics' Building on Saturday evening, March 5, and will continue throughout the present week, contains an unusually representative selection of electric automobiles and accessories for both pleasure and commercial service. The progress which has been made in electric vehicle design during the past two years has proved to be a revelation to the New England public. In this section dealers have had to overcome the handicap of various unfortunate early experiences in the commercial field, and the introduction of pleasure cars has been seriously retarded by the failure of many central stations to offer battery-charging facilities at points within the effective radius of action of these machines. All this is now passing away. Through the well-directed efforts of the Electric Vehicle and Central Station Association, the first of its kind in the country, the manufacturers, central stations and the public are being brought closer together; the improvements in equipment design over the styles of apparatus in service a few years ago are being exploited, and an aroused interest in the purchasing public bespeaks a healthy growth of the industry from this time forward.

Thus far the commercial machine has held the center of the stage in New England, and perhaps rightly so, since in this field lies the best opportunity to demonstrate actual financial economies in relation to the volume of traffic handled. The pleasure field has not been neglected, but the importance of displacing the horse in the larger industrial applications has naturally appealed most strongly to the engineers and central-station managers who are trying to broaden out the applications of electricity to cover the entire range of transportation requirements in modern city and industrial life. From the larger installations of electric vehicles in mill yard and heavy trucking service New England is rapidly selecting the electric automobile for the smaller but more numerous uses which mean so much to the central station in the aggregate and to the purchaser in individual cases. The exhibits at the Boston Show, therefore, reflect this tendency, and at the side of trucks for the heaviest service are displayed vehicles for rapid action in the field of light deliveries, and in such departments of industry as floral decoration, bakery service, confectionery, printing, and other branches where the merchandise units are light in weight or small in bulk.

In the electric vehicle section a prominent exhibit is that of the Studebaker Brothers Company, which displays a 7½-ton truck as the center of interest. This is said to be the largest electric truck ever exhibited in New England. It carries the usual features which this company's designers have brought forward in recent years, with the spring suspension of the battery, use of a longitudinally adjustable driver's seat, and with two motors for heavy service. The driving wheels of this truck are 42 in. in diameter; the speed of the truck at full load is 9.2 miles per hour; and in trans-city service, with suitable loading and unloading facilities, the truck has a capacity of over 150 tons per day. The company also shows a 1000-lb. bakery wagon, over a score of which are in use by a single house in Lowell.

The General Vehicle Company is showing a new 3½-ton truck built for the well-known chocolate house of Walter Baker & Company, Boston; a special electric emergency automobile for the Boston Edison Company, and a new design in the form of a 3-ton coal delivery truck. The first-named exhibit has a mileage of 40 per charge, a maximum speed of 8.5 miles per hour, and a capacity of at least three times the work possible to handle by two 2-horse teams. The new coal truck has three separate compartments for the carriage of different kinds of fuel if desired, and each compartment has separate dumping doors on each side of the vehicle. A novel feature is a motor-driven lift for raising the body by a worm gear, a 1-hp motor being installed for this service, which is a great improvement in speed over the usual method of raising the body by a hand screw. The new Edison wagon is equipped with a battery capable of driving it 100 miles on a charge, the speed being 12 miles per hour. It is to be used by the emergency department for pumping out basements, manholes, and other places in case of flooding, and is equipped with a 3-hp motor-driven centrifugal pump, operated from the propelling battery.

A large number of electrically driven pleasure vehicles are exhibited by well-known makers. S. R. Bailey & Company are showing a 1910 model victoria phaeton equipped with an "Edison" battery of the "A-6" type, installed in 54 cells and capable of running 150 miles per charge, with a maximum speed of 22 miles per hour. The weight of the vehicle complete is 2000 lb., and it is provided with the usual hand-wheel steering mechanism. A single motor operates the car. This company also shows a phaeton equipped with a 40-cell battery of Exide make. The Rauch & Lang Carriage Company shows, among a number of attractive machines, coupés and runabouts, with electric braking, differential-compound motor and face-plate controller mounted under the seat. The batteries are divided and assembled into receptacles located over the front and rear axles, and doors are provided in the hoods of the body so that inspection or removal can be easily made. An extra large commutator is a feature of this equipment. The Boston Electric Garage Company is showing a line of the latest "Detroit" electric pleasure vehicles, notably of the type which made the run successfully in the Munsey Reliability Contest between Washington, D. C., and Boston, Mass. The Baker Motor Vehicle Company, Columbus Buggy Company, Dodge Motor Vehicle Company, and Columbia Motor Car Company, are also displaying their 1910 models, representing the latest types of body and chassis equipment, flexibility of control, and improved driving designs.

A large number of manufacturers of accessories have taken space at the show, including the American Storage Battery Company, American Ever-Ready Company, Atwater-Kent Manufacturing Company, Arseno Electric Company, Bi-Motor Equipment Company, Burn-Boston Battery Company, S. F. Bowser & Company, Bosch Magneto Company, Connecticut Telephone & Electric Company, Couch & Seeley Company, Coates Clipper Manufacturing Company, Eco Manufacturing Company, Electric Storage Battery Company, Edison Storage Battery Company, Heinze Electric Company, Stackpole Battery Company, C. F. Splitdorf, Standard Thermometer Company, U. S. Light & Heating Company, Westinghouse Electric & Manufacturing Company and the Boston Y. M. C. A. Automobile School.

The illumination of the show was unusually attractive. The exhibits are arranged upon the floor with a background representing a New England country-side scene. The main hall on the east side of the building is designed as a New England apple orchard in full bloom, all the posts having been transformed into tree trunks, with artificial foliage and blossoms filling the air in realistic fashion. Carbon-arc lamps are used extensively to set off the colors of this foliage, with incandescents at the booths for closer inspection of exhibits. In another main hall is a flower garden with shrubs and bushes electrically illuminated in a tasteful and simple manner. While there are few novelties in the illumination, the work has been done with much taste. Extensive applications of portable lamps have been installed to permit visitors to examine the working details of the machines shown, and in a number of cases, small motors are in use to demonstrate moving parts and their relations. In a noteworthy case a chassis is revolved slowly upon a horizontal axis, and as each part of interest comes into view a small electrically lighted transparency near the detail of the mechanism is lighted, the face of the plate bearing a succinct description of the part to be emphasized. In the show as a whole are 107,000 sq. ft. of floor space. The total number of cars exhibited is 558 pleasure cars, 84 commercial vehicles, and 181 demonstrating cars. In preparing for the show 50,000 sq. ft. of lumber were used, with 30,000 yd. of drapery, 20,000 yd. of floor covering, 15,000 ft. of painted scenery, and 5000 ft. of foliage. In a pergola in the main hall 1000 incandescent lamps are used. The show is under the usual management of Chester I. Campbell, of Boston.

SHOW-WINDOW LIGHTING.

While there has been much wastefulness and inefficiency in show-window lighting, there has recently been a decided advance in this art, the aim now being to concentrate the light on the goods or other display, where it is needed, instead of on the ceiling or other parts of the window or on the sidewalk. The tungsten electric incandescent lamp, with suitable reflectors, is now used to a large extent for this purpose. The aim in modern show-window lighting is to show no exposed light in the ordinary range of vision, much in the same manner as the stages of theaters are lighted. The accompanying diagram was prepared by the National X-Ray Reflector Company, of Chicago, and is based on tests made by engineers of that company in a recent study of show-window lighting.

The diagram shows a cross-section of a window 7 ft. deep which is to be trimmed to a maximum height of 7 ft. at the back. The lamps are placed 13 ft. above the floor of the window near the ceiling and are equipped with the X-Ray helmet silver-plated opaque reflector, which was especially designed by the company named for lighting windows of this class. The distribution of light from this reflector, as shown by tests, is said to be about as indicated by the diagram, and it will be seen that nearly all of the light is delivered on the goods in the window. Furthermore, over 800 maximum downward candlepower is obtained, which, according to the company making this reflector, compares with less than 300 cp in the case of the translucent or prismatic reflector using lamps of the same size.

Show Window Lighting.

Of course with windows of differing dimensions, different reflectors may be required. It is important to use the right reflector for the window to be illuminated. It is not enough simply to prevent the light from falling outside of the window space. The reflector must have an efficient reflecting surface so as to direct into the window the light which would otherwise escape in other directions. The reflecting surface of the X-Ray helmet reflector is pure silver plating.

The number of lamps per front foot of window or the watts per front foot required for good window illumination depends on varying conditions. For example, in a small country town a single reflector may give a better illumination to a window with an 8-ft. frontage than is common among the other windows in the town. In large cities, and especially where dark-colored dry goods and men's clothing are displayed, some merchants consider that a window cannot be too brilliantly illuminated. Attention must also be devoted to the window trimming itself. Sometimes it is almost impossible to light properly the goods displayed. The trimmer should always remember the direction from which the light is coming. Goods should not be arranged so that they cast shadows on themselves or on other goods.

WESTINGHOUSE FANS FOR 1910.

The direct-current and alternating-current fans listed by the Westinghouse Electric & Manufacturing Company for 1910 include numerous types and sizes intended for all classes of service. The direct-current motors are designed to operate on nominal 110-volt and 220-volt circuits; the alternating-current motors on the same voltages and any commercial frequency.

The 12-in. and 16-in. swivel and trunnion desk fans may be readily converted into the bracket type by means of a simple adapter, without the use of tools and without disconnecting the lead wires. These fans can be adjusted through a wide angle in both the horizontal and vertical planes, thereby permitting the breeze to be directed as desired. The variable speeds for which they are designed make them suitable for residences, offices, clubs, etc.; the lowest speed produces a moderate breeze, while at the highest speed the fan delivers a very strong breeze suitable for a large room during the hottest weather. The finish of the motor body and fan base is polished black enamel. The blades are finished in polished and lacquered brass, and the guard is dipped and lacquered brass.

The oscillating motion of the 12-in. and 16-in air-operated oscillating desk fans is produced by the reaction of the air from the fan upon two small vanes which are alternately thrown directly across the path of the breeze on either side of the center of the fan. These fans are so designed and constructed that they will oscillate through any angle, or will rotate on their axes, thus setting the air of the room in circulation.

The 8-in. desk and bracket fans are designed for use where strong breezes from the larger fans would be objectionable. Being hinged mounted, they can be quickly changed from the desk to the bracket type.

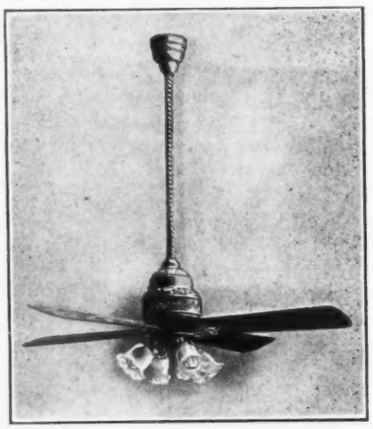


Fig. 1—Direct-Current Ceiling Fan.

In hospitals, libraries, sleeping-rooms, etc., it is imperative that fans run without noise. For such places the six-blade, slow-speed residence type is especially preferable, as it delivers a moderate breeze through a considerable range and performs its functions very quietly. Either one of two speeds may be obtained by means of a self-contained switch and speed regulator. Residence fans are furnished in the swivel and trunnion desk and bracket and air-operated oscillating desk types, and are of the same high-grade construction as the standard 12-in. and 16-in. fans. These fan motors are arranged for 60-cycle circuits only.

The 8-in. telephone-booth fan motors are exactly similar, in electrical design, to the 8-in. desk and bracket type, but are spring suspended; this arrangement prevents the transmission of the vibration of the moving parts to the booth. To facilitate the removal of the fan motor from the bracket for cleaning, etc., without disturbing the base or wiring, a connector is provided in the circuit between the motor body and the fan base.

The converting sub-base for 8-in. fan motors permits the use of the 110-volt, 60-cycle fan motors on 110-volt, direct-

current circuits, or on 110-volt alternating-current circuits of 25, 30, 40 or 50 cycles. This device will prove of particular advantage to those purchasers of alternating-current fans who may in the future require fans for different circuits from those upon which the motors were originally intended to operate.

The Westinghouse ceiling fans are said to have given good service in those places where large fans suspended from the ceiling produce better results than the desk and bracket types. Two standard finishes and speeds are supplied for use on alternating-current circuits, namely, ornamental mottled copper finished motors having three speeds, and plain black japan-finished motors having two speeds. Three-speed, direct-current ceiling fan motors are finished in mottled copper, while those having one speed only are finished in black japan.

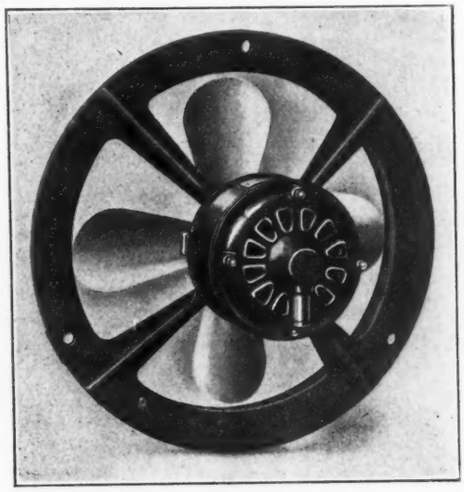


Fig. 2—Ventilating Fan with Alternating-Current Motor.

With the exception of the method of mounting, the ceiling and column fans are practically identical. They are provided with four blades made of wood finished in mahogany. A speed regulator and switch are located directly beneath the motor body. The counter column and floor column fans are used to great advantage in places where the ceilings are too low or too high to permit the use of the ceiling fan. They are especially adapted for stores, restaurants, etc. The columns of the floor column fans are of sufficient length to bring the blades approximately 7 ft. above the floor, while those of the counter column fans are of suitable length for mounting on tables or counters.

The ventilating fans act to exhaust air from rooms and enclosures, and draw heated air or fumes from kitchens, chemical laboratories, etc. Except for mounting, the motors of these fans are practically the same as the 12-in. and 16-in. desk fan motors.

UNDERGROUND CONDUIT CONSTRUCTION FOR RAILWAY SIGNALING.

Electric signal circuits used in railway train operation comprise one of the most important and vital elements in maintaining traffic over the road. With such wires installed on poles, where they are subject to wind and sleet damage, interruptions sometimes occur, due to "lines down," seriously impairing the movement of trains until emergency schedules can be put into operation or workman summoned to repair the breaks. A typical case of wire damage is illustrated in the accompanying view, which shows what may happen when sleet and wind attack open aerial construction.

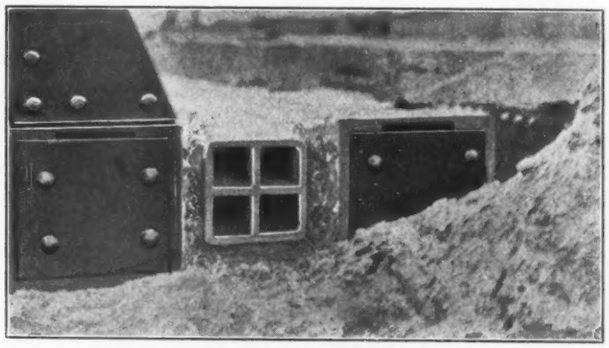


Fig. 1—Duct Tile Conduit in Bridge.

The system of underground conduit construction described herewith has, of course, the advantage of complete protection of the signaling circuits, insuring absolute continuity of operation. At the same time, it has been designed with a special view to low cost of installation. As Figs. 3, 4 and 5 show, the construction comprises a subway of vitrified-clay conduits laid in a trench excavated between the tracks.

Either single or multiple conduit may be used, depending on the number of wires to be carried. The necessity of manholes, often items of much expense, is eliminated, as it is quite possible to rod and draw the cable into clay ducts of 1200-ft. lengths. Assuming the signals to be placed a mile apart, four splices would be required for drawing in. These splices are then encased in split conduit, bound with wire, and covered with concrete to the surface of the subgrade, a marker being left to show the location of the joint in case future access proves

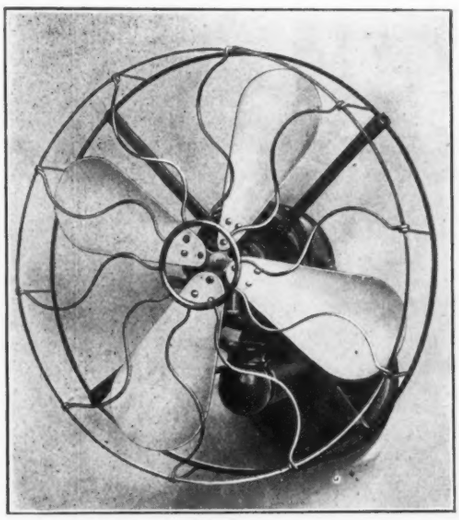


Fig. 3—Swivel and Trunnion Desk and Bracket Fan.

Fig. 4—Fan with Sub-Base Converter.

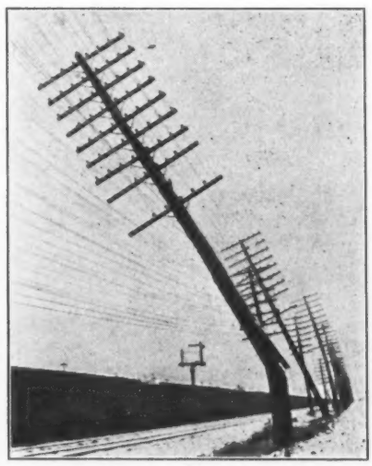


Fig. 2—Sleet and Wind Damage to Lines.

necessary. With this method of construction, it becomes an easy matter to replace any length of cable, by opening up the joints and drawing in a new piece. The vitrified clay is a good insulator, and affords protection to the cables from stray earth currents. Being water and fireproof, ducts of this material give superior mechanical protection to the cables.

When installing such a conduit for signal wires, additional

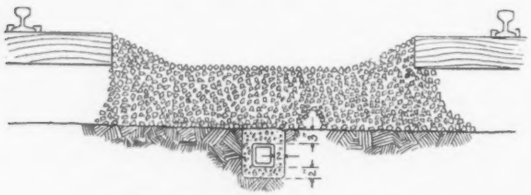


Fig. 3—Single Duct Formation.

ducts should be provided for the telephone and telegraph wires, as these can be added at little increased expense during the construction of the first run. When the subway consists of two or more ducts, junction boxes are recommended every 500 or

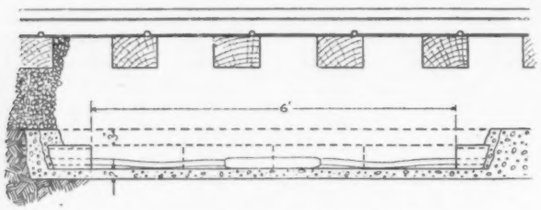


Fig. 4—Elevation of Completed Splice.

600 ft. to provide easy access to the cables, for pulling in additional conductors or making changes. Fig. 5 shows a concrete junction box which eliminates the necessity of iron covers, and which can be built at comparatively small expense. Fig. 1 illustrates a four-duct conduit laid across a Chicago & North-

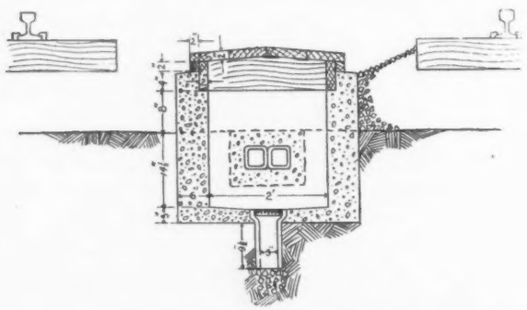


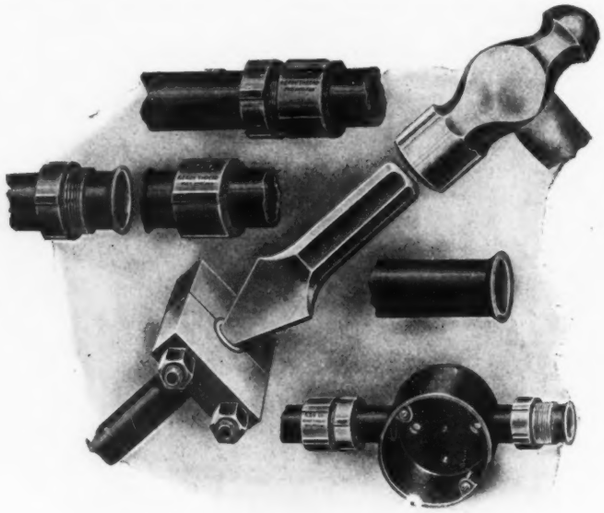
Fig. 5—Concrete Junction Box.

western Railroad bridge, the vitrified-clay conduit for which was furnished by the McRoy Clay Works, manufacturers of underground conduits for electrical subways, The Rookery, Chicago.

INTERIOR WIRING CONDUIT COUPLING.

The conduit coupling shown herewith, known by the trade name "Ready-Thread" coupling, and made by the K. & B. Company, Philadelphia, has for its purpose to reduce the labor on conduit work by eliminating the necessity of threading the cut ends of conduit. As will be seen from the illustration, the conduit when cut is prepared for coupling by means of a split die and taper drift, one of the latter being sufficient for conduit from ½ in. to 1½ in. The coupling does away with the necessity of right-hand and left-hand threads, and the beveled interior at the ends enables fish wire and cables to be more easily inserted.

As the pipe itself does not have to be turned, consecutive lengths may be bent to longer curves, thereby making pulling-in of the wires easier and quicker, while riser conduits may be laid close to walls and bent to fit in offsets, thus saving room and making a better looking job. The coupling takes care of variations in external diameters of different makes of conduit, and also permits a conduit run being started at a number of points by different gangs of men, the sections being connected by "Ready-Thread" couplings as they meet. It is stated that one



Interior Wiring Conduit Coupling.

man will form flanges on ends and couple up two lengths of conduit in half the time required for simply cutting the threads by the old method; and that on sizes 1 in. and larger one man will finish a joint in less time than it would take from two to four men to thread the pipe with a stock and die, an operation requiring a pipe vise and bench, set of threading dies and stock, and reamers, all of which are dispensed with by the method described.

CHAIN DRIVE WITH V-SHAPED SHEAVE.

A chain drive of recent invention which seems to have several points of advantage is shown in Fig. 1 connecting an electric motor and a vacuum pump. In the application illustrated,

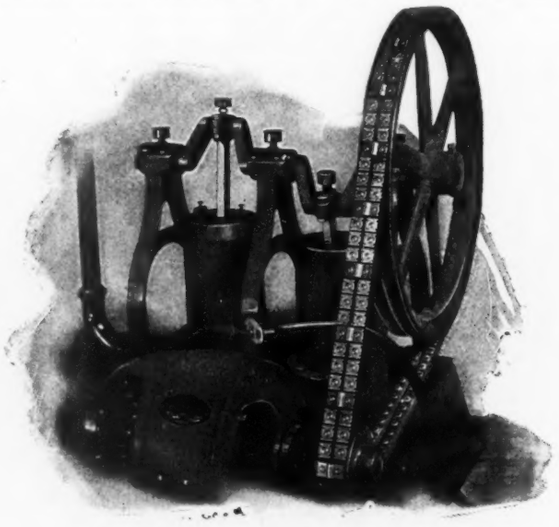


Fig. 1—Chain Drive with V-Shaped Sheave.

the driving pulley on the motor shaft is 4 in. in diameter and the driven sheave is 24 in. in diameter. The centers are 25 in. apart and the belt speed is 1850 ft. per minute. As shown in Fig. 2, which represents the details of this system of transmission, the belt consists of a bevel steel chain for a core,

a continuous strip of rawhide on the under side and a sectional strip of friction board at the top, all parts being held firmly in place by a rivet passing through them. The joints of the chain are frictionless and are designed so that the bearing surfaces of tool steel roll against one another. The method of construction is such that the friction material can bend around small sheaves without injuring the fibers. The belt runs in a V-shaped groove in the sheave of the driven machine. This mechanical transmission is operated on the principle of the wedge, the grooves in the sheave being made the same angle as those of the belt and deep enough to prevent the belt from coming in contact with the bottom of the groove. The wedging action produces the necessary friction to transmit the energy with slack belts.

This belt is particularly adapted for electric drive and it can be used on motors of the highest speed, utilizing the

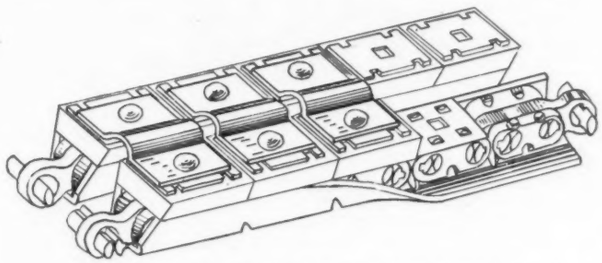


Fig. 2—Details of Chain Drive with V-Shaped Sheave.

economy of these motors, as it permits large speed ratios, for example, 15 to 1. The sheaves used with the V-belt are the same as the standard sheaves used for rope drive with the exception of the special V-shaped groove. Where more than one strand is required to transmit the necessary power, the individual strands are connected with steel straps across the top, making one unit of the multiple strands. The strain is thereby distributed evenly over all the strands. The belt is adapted to varying requirements and to both large and small motors, but to obtain the best results it is necessary that each drive be designed according to the exact conditions under which it is to be used. Special points of merit to which attention is directed are the durability of the belt and its noiselessness and inexpensiveness.

One advantage of this transmission is that the pressure is exerted at every unit of area at the side of the wedge. The weight of the belt causes it to gain considerably in arc of contact as long as a reasonable center distance is provided. In theory, applying the principle of the wedge, this belt should have a capacity for the transmission of power four times as great as that of a flat leather belt. The manufacturer says that this theory is more than verified in practice. A small size V-belt 7/8-in. across the top is calculated to transmit 1 hp per minute for every 300 ft. of lineal contact. A larger belt, 1¼ in. across the top, needs about 200 ft. of lineal contact per minute per horse-power. This estimate is modified, of course, by difference in distance between centers, but is given as true for average normal conditions.

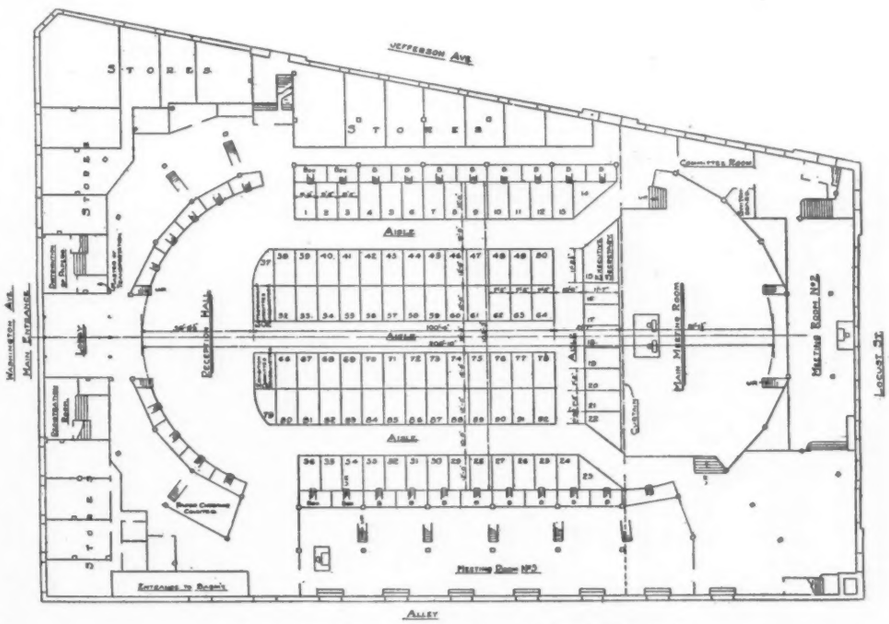
The belt is capable of very high speed. On small pulleys it will easily travel 3000 ft. a minute, it is said, and on large ones it may travel even 5000 ft. a minute. It requires but little attention and is adaptable to a wide application for direct motor connection, the principal aim in its design being to give the maximum of capacity for power transmission and at the same time great durability. Much care is taken in the making of all forms of this belt by the manufacturer, the Peerless V-Belt Company of 334 South Clinton Street, Chicago.

EXHIBIT ARRANGEMENTS FOR THE ST. LOUIS CONVENTION OF THE N. E. L. A.

The Exhibition Committee of the National Electric Light Association has completed the arrangement of the exhibit space in the Coliseum of St. Louis, where the next convention of the association will be held May 23-27. The Coliseum is a modern steel and concrete structure of approximately the size of Madison Square Garden, New York. As indicated on the accompanying plan, one end of the arena will be completely separated by a heavy asbestos partition, making a quiet and spacious room for convention meetings. In addition there will be two smaller rooms for parallel sessions, and the balance of the arena has been assigned to the exhibitors.

A floor plan of the exhibition hall is given in the accompanying engraving. There will be 92 booths containing on an average of 85 sq. ft. The booths, which will be on platforms 5 in. higher than the floor, will be suitably decorated. Four 10-ft. aisles will provide convenient access to every booth, and the floor plan has been so designed that all booths will have practically equal advantages. At the end of the exhibition hall a large space will be converted into a reception hall and general lounging place, which will serve as the lobby of the convention. Through the courtesy of the Union Electric Light & Power Company, 115-230 alternating and direct current for the operation of the exhibits will be furnished without charge, the alternating current being single-phase and three-phase, at 60 cycles.

Mains of ample current-carrying capacity will be provided at every booth where energy is desired, connection at the booth, however, being made at the expense of the exhibitor. For the convenience of visitors, arrangements have been made with a transfer company for the handling of exhibits between the freight yard and the Coliseum. It is the intention of the committee to assign space not later than March 15. Mr. Frank H. Gale is chairman, and Mr. Walter Neumuller, 55 Duane Street, New York, is secretary of the exhibition committee.



Floor Plan St. Louis N. E. L. A. Exhibition Hall.

Industrial and Commercial News

The Week in Trade.

TRADE conditions continue to be rather irregular, and spring business is backward in many portions of the country. This is largely attributed to unfavorable weather and to flooded streams and bad country roads, but is also in a measure due to that spirit of conservatism which has been noticed and commented upon since the beginning of the year. The extremely high prices of all necessaries of life have caused many retail merchants to hesitate about stocking their shelves too fully. They are uncertain as to the amount customers will buy when prices are on such a high level. While the condition of the individual is, on an average, more prosperous than at any time in recent years, there seems to be a more general disposition to economize than ever before. Among the wholesalers and jobbers there are some orders coming in for fall delivery, and there are some reorders being received for spring goods. The later are not, however, as heavy as have been expected. During the past week there have been dozens of reports circulated concerning crop damage, but the effect upon the speculative market has not been what was anticipated. In fact, wheat and corn were lower at the end of the week than at the beginning. Crop damage stories have, in a measure, lost their potency. The best advices as to conditions and also as to trade are received from the Northwest and Southwest. Weather conditions have been more favorable in these sections than in the Central States. The industrial situation continues to be first class. Iron and steel show a rather larger business, but it is stated that there have been some concessions made in prices. The building trades and out-door construction promise a large measure of activity in the near future, and arrangements are now being made to begin work in many sections. Collections continue to be slow and unsatisfactory. In fact, it is not too much to say that in this direction no improvement has been shown since the beginning of the year. Failures for the week ended March 3, as reported by *Bradstreet's*, were 184, as against 254 the week previous, 219 in the same week of 1909, 287 in 1908, 172 in 1907 and 177 in 1906.

The Copper Market.

DURING the last week the copper market showed a pronounced improvement, and the situation is now declared to be stronger than it has been at any time for many months. There are indications that large consumers of metal are either buying or preparing to buy considerable quantities, and prices during the week reflected this sentiment by substantial advances. Electrolytic was ¼ cent higher at the end of the week than at its beginning. It is said that within the past few days wire drawers have made comparatively large purchases of metal, and this is regarded as significant from the fact that this branch of the industry has been lagging for a number of months. Even now it is not believed that wire makers are consuming more than 50 or 60 per cent of normal amounts. While it is probable that the February report of the Copper Producers' Association will show a slight increase in surplus stocks, such figures will not be particularly significant. Domestic takings will probably be in the neighborhood of 60,000,000 lb., and the exports for the month probably about 40,000,000 lb. The actual exports for the month are considerably larger than this, but as many of the shipments made in the earlier portion of February were on contracts concluded in January, they were included in the January report of the association. Another encouraging feature of the market is that there has been an increase in consumption abroad, and in addition to this—or possibly on account of it—there has been a revival of speculative interest in London. Such a revival always means an advance in price. Many of the contracts now being placed in this market are for May delivery, and some for delivery even as late as June. Exports of copper for the month, including March 7, have been 3878 tons. At the daily call on the Metal Exchange March 7 standard copper was quoted as in the accompanying table.

	Bid.	Asked.	Settling price.
Spot	13.05	13.25	....
February	13.05	13.25	13.15
March	13.05	13.25	13.15

Market dull.

The London market, March 7, was as follows:

	Noon. £	s	d	Close. £	s	d
Standard copper, spot	60	2	6	59	17	6
Standard copper, futures	61	0	0	60	15	0
Sales of spot				600 tons		
Sales of futures				500 tons		

Extreme fluctuations for this year:

	Highest.			Lowest.		
Standard	13.50			12.95		
London, spot	£62	0	0	£58	17	6
London, futures	62	18	9	59	15	0
London, best selected	65	10	0	63	0	0

Industrial and Commercial Notes.

Platinum May be Higher.—The refiners of platinum in this country declare that if the reports which have recently been received from Russia are true, the effect will be to almost double the price of platinum, and to practically put the American refiners out of business. About a year ago the Russian government appointed a commission to look into the platinum situation in that country—from which 95 per cent of the crude platinum of the world is produced. It is now said that the commission will recommend that the government fix a minimum price at which refined platinum may be sold for each year, and that the price next year will be in the neighborhood of $710 a pound. As refined platinum is now sold in this country at about $29 an ounce, troy weight, such an official figure would practically be doubling the present price. It is believed by the refiners here that the result of such a course would be to force the refining of all platinum in Russia. The refiners say that the consumption of platinum has vastly increased within the last twelve months, and that at the present time it is almost double what it was a few years ago.

May Abandon Morris Canal.—It is said that if the Legislature of New Jersey takes steps for the abandonment of the State's control of the Morris Canal the property will probably come into possession of the Public Service Corporation, and will be used as a right-of-way for a high-speed electric railway between Newark and Morristown. It is said that the Public Service Corporation stands ready to buy the canal as soon as the State's rights in the property are settled. The present value of the canal is estimated to be in the neighborhood of $80,000,000, but it is well understood that the present owners would be willing to dispose of it for a very much smaller amount. The taxes on the property now run about $2,000,000 a year, but its earning capacity is very limited. The officials of the Public Service Corporation admit that the canal project has been considered, but say that nothing can be done until the Legislature abandons the property and the courts have determined its proper title.

To Celebrate Electrification.—The Westchester County Chamber of Commerce has decided that the day on which the new electric service on the Harlem division of the New York Central is opened is to be celebrated by a demonstration at the stations along the route, and particularly at White Plains. It is intended to run a special train for the use of the members of the chamber and their guests, to stop at each of the stations between Mount Vernon and White Plains, and to be met by a reception committee at the county seat.

Brooklyn Rapid Transit Equipment.—The Brooklyn Rapid Transit Company has asked for bids for about 9000-kw equipment in rotaries and transformers for use in its substations. It is probable that the contract for this apparatus will be let before the end of the present month.

Allis-Chalmers Supplies Eau Claire Hydroelectric Equipment.—The complete hydraulic equipment for the Red Cedar plant of the Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis., comprising one 3600-hp generator unit operating under a 48-ft. head and placed in a hollow dam of the Ambursen Hydraulic Construction Company's build, with complete hydraulic governor and 170-hp exciter uit, also head gates, trash racks, etc., for the plant, has been ordered from the Allis-Chalmers Company. This covers the first of four generator units and the first of two exciter units which are to comprise the ultimate capacity of the plant.

Train Dispatching by Telephone on Southern Roads.—The Georgia Railroad Company will install within the next few weeks telephone equipment for dispatching trains between Augusta and Atlanta, Ga., 171 miles, and from Camak, to Macon, Ga., 74 miles. There will be twenty-eight regular stations and five siding telephones on the line from Augusta to Atlanta, and twenty regular stations from Camak to Macon. This installation is the first in that section of the country. Railroads in the South have recently been active in adopting the telephone method of handling the movement of trains. The Southern Railroad has purchased from the Western Electric Company equipment for the installation of telephones and selectors on a portion of its line, and it is reported that the equipment of the other divisions will soon follow. The Chesapeake & Ohio has completed the installation of similar equipment on the Cincinnati division and expects to have installed within a short time equipment on three of its other important divisions. The Norfolk & Western Railroad has equipped a large portion of its line, and plans to cover its entire system. The Seaboard Air Line has installed the telephone on two of its divisions, and reports that the service is so satisfactory that extensions are being considered. The Atlantic Coast Line has for some weeks been handling train movements on one division and plans to extend the service on others as soon as construction work can be completed.

15,000-hp Ohio Hydroelectric Project.—Following are further details of the proposed hydroelectric development near Chillicothe, Ohio, referred to in these columns last week. The name of the company is the Paint Creek Power, Light & Heat Company, and it is proposed to construct five dams on Paint Creek, the lower dam being near where the stream empties into the Scioto River. The first dam will be about eight miles south of Greenfield, O., and the fifth dam will be about four miles west of Chillicothe. Paint Creek is between 80 and 100 miles long, with a drainage area of about 1000 miles, and is fed by numerous tributaries. The total available fall from Greenfield to Chillicothe is 286 ft. It is proposed to dam one of the tributaries for a storage reservoir, which will be connected with the reservoir of the uppermost dam by a tunnel about ⅓ mile long; the two reservoirs will have a capacity of about four billion cu. ft. and cover an area of 4300 acres. It is stated that the proposed dams will enable between 15,000 and 20,000 hp to be developed. The final survey is now being completed by Mr. I. J. Miller, of Cincinnati, O., with whom Mr. John M. Waddell, of the Waddell Wooden Ware Works Company, of Greenfield, O., is associated in the project.

P. R. R. Order for Allis-Chalmers.—The management of the Pennsylvania lines west of Pittsburg has placed an order with Allis-Chalmers Company for electric generating units to increase the capacity of the power plant at Conway, Pa., from which current for operating the shops there, and also for railway signal work, is supplied. The new machinery consists of two 750-kva, 3600-r.p.m., 60-cycle, three-phase, 2300-volt steam turbo-units. Of two units for exciting the alternators, one is a 25-kw, 120-volt, 260-r.p.m. direct-current generator coupled to an engine, and the other a 25-kw, 125-volt generator, direct-connected to a three-phase, 60-cycle, 2300-volt, 900-r.p.m. synchronous motor. This motor is rated at 150-kva and, beside driving the exciter unit, will serve as an electrical condenser and thus improve the power factor of the station. Two 12-kw flywheel type motor-generator sets will be installed in the station for supplying current for the railway signal system, each consisting of a 12-kw, 600-volt, shunt-wound generator direct-coupled to a 220-volt, 1720-r.p.m. induction motor.

General Electric Company's Year.—The official figures of the General Electric Company for the year which ended Jan. 31, 1910, has not yet been made public, but it is understood that the gross business was approximately $60,000,000—these were the figures given in our issue of Jan. 6, 1910 as the probable business of the company. This is an increase of nearly 35 per cent, or $15,500,000, as compared with the preceding year. The fiscal year of the company, which heretofore ended Jan. 31, has been changed to end Dec. 31, so that the next official report will only embrace 11 months. The company says that it now has on hand all the business in turbine engines that it can handle during 1910, and has some special orders which will not be delivered until 1911.

Morgan to Fight Bell Telephones?—Formal announcement was made in Cleveland last week by the directors of the United States Long Distance Telephone Company, which recently came into the control of J. P. Morgan & Company, together with the Cuyahoga Telephone Company, at Cleveland, that a reduction and readjustment of rates would be made at once. The directors authorized Frank A. Davis, president of the company, to use his own discretion in making such rates as were necessary to meet competition. The company is now entirely controlled by Morgan interests, and the present move is taken to mean that an active fight for business will be made.

Importations of Carbons.—The importers of high-grade electric light carbons declare that the increase in the tariff has not so far had any demoralizing effect upon their business. The importations have been about equal to what they were heretofore, but the importers have been compelled to narrow their profits, and in some instances to reduce prices. Domestic manufacturers, it is claimed, have reduced prices to a considerable extent since the new tariff law went into effect, and this in connection with the high duties has made the business of importers less profitable. They claim, however, that the volume of business is very satisfactory.

Another Georgia Hydroelectric Plant.—A third hydroelectric development for Butts County, Georgia, is probable in addition to the Towalgia River Falls Power Company and the Central Georgia Power Company, which is completing a $3,000,000 plant on the Ocmulgee River to develop 22,000 hp. The third development is the proposed plant at Smith's Mills, on the Ocmulgee, projected in connection with the building of the Middle Georgia Interurban Railway by Captain W. F. Smith, of Jackson, Ga., and his associates. The new development is at the site of an old development, and it is said that the new work could be accomplished at reasonable outlay.

Hydroelectric Activity in Mexico.—Confirmation is had of the recent report that the Hidalgo Hydroelectric & Irrigation Company's power plant and transmission line holdings at Pachuca, which were recently acquired by the Mexican Light & Power Company, will be merged into the latter's system. There is great activity in mining operations in the Pachuca district at this time, and the demand for electric power is constantly increasing. More than 6000 hp is now being used, and it is stated that double this amount will find a ready sale as soon as the company can arrange to provide it.

Traffic in the Hudson Tunnels.—William G. McAdoo, president of the Hudson & Manhattan Railroad Company, announced that during January the tubes carried 4,150,169 passengers, or an average of 133,876 per day. During February the average was 137,746 per day. This shows a gross increase of 61 per cent over August, 1909, which was the first month of operation of the present tunnel system. Feb. 28 was the largest day in the history of the tunnels, more than 197,000 passengers being carried on that day.

Electrical Construction.—Among the items printed under Construction News in our present issue are announcements of proposed new plants or considerable extensions of present plants at Albany, Ga.; Atlanta, Ga.; Athens, Ga.; Baxter Springs, Kan.; Syracuse, N. Y.; New Orleans, La.; Malden, Mo.; Wadesboro N. C.; Pittsfield, Mass.; Needles, Cal.; Niagara Falls, Ont., Can.; Price, Utah; Idaho Falls, Idaho; Sweetwater, Nev., and Homer City, Pa.

Extending Conduits in Montreal.—The Montreal Light, Heat & Power Company has decided to install an underground conduit system in the eastern portion of the city. This will necessitate the laying of 60,000 ft. of cable and the taking down of 62½ tons of copper wire. The new conduits will be laid between Mentana and Marie Annie Streets and between Orleans and Forsythe Streets. The company will spend nearly $200,000 a year on this work.

To Remodel Switchboard Equipment.—The New York & Queens Electric Light & Power Company has placed a contract with the Westinghouse Electric & Manufacturing Company for the remodeling of its entire switchboard and switching equipment. The company has also placed an order for four 500-kw air-blast transformers with the same manufacturers.

To Increase Niagara Falls Plant.—The Electrical Development Company of Ontario has drawn plans to increase its generating plant from 50,000 hp to 85,000 hp. The company controls the Toronto & Niagara Power Company. The new work will cost about $500,000. The energy of the company is mainly sold in Toronto, 80 miles distant.

Financial.

The Week in Wall Street.

THE past week in Wall Street has shown a decided improvement in sentiment, and a considerable return of that cheerfulness which dominated the market in the late fall. Prices have been stronger and operations have been more active. There is some evidence of outside buying, and a little better indication that money is seeking permanent investment in stocks and bonds. This of itself demonstrates the fact that confidence is in a measure returning. Wall Street for the moment seems to have lost its dread of decisions adverse to corporations and of drastic legislation. At one time during the past week there seemed to be a determined effort on the part of bear operators to depress prices, but the stubbornness with which the market resisted this effort shows that the tone is healthy, and that artificial manipulation in the downward direction will be difficult. The leaders in the upward movement have been Steel common and Union Pacific. These are the prime favorites of speculators, but at the same time they are generally regarded as good investment propositions and are popular with outside traders. The bond market is somewhat improved, but is still far from satisfactory to those who are attempting to finance extensive developments. The money market continues to be easy and cash is plentiful. Quotations March 7 were: Call, 2½@3 per cent; 90 days, 3¼@4 per cent. The quotations in the table are those of the close March 7.

NEW YORK.

	Feb. 28.	Mar. 7.	Shares sold.		Feb. 28.	Mar. 7.	Shares sold.
All.-Ch.	12	12	500	Int.-Met., pfd.	55¾	56⅜	16,900
All.-Ch., pfd.	41*	43*	100	Mackay Cos.	88¾	91	400
Amal. Cop.	76¾	83¼	158,050	Mackay C., p.	76	76½*	620
Am. D. T.	20½*	20½*	———	Man. Elev.	135½	138¾	1,350
Am. Loc.	51	55⅜	4,600	Met. St. Ry.	18*	15*	500
Am. Loc., pfd.	111½	112½	600	N.Y.&N.J.Tel.	139¼*	139¼*	———
Am. Tel. & C.	77*	75	———	Steel, com.	80½	88½	809,840
Am. T. & T.	141	142	12,000	Steel, pfd.	120⅛	122	9,000
B. R. T.	75⅛	76½	19,810	W. U. T.	76	78	13,120
Gen. Elec.	154½	155½	3,400	West'h., com.	70¾	73½	2,300
Int.-Met.,com.	22⅛	22½	16,700	West'h., pfd.	130*	125	———

PHILADELPHIA.

	Feb. 28.	Mar. 7.		Feb. 28.	Mar. 7.
Am. Rys.	46½	45¾*	Phila. Elec.	15½	15¼
Elec. Co. of A.	11⅞*	12*	Phila. R. T.	24¼	23
Elec. St. B'ty.	59¾	61	Phila. Trac.	88	89
E. S. B'ty, pfd.	30*	30*	Union Trac.	50¼	49⅜

CHICAGO.

	Feb. 28.	Mar. 7.		Feb. 28.	Mar. 7.
Chi. City Ry.	180*	185	Chi. Tel. Co.	131	132
Chi. Rs., Ser. 1	106*	106*	Met. El., com.	17*	17*
Chi. Rs., Ser. 2	32½*	32	Met. El., pfd.	51	55*
Com. Edison	116½	115	Nat'l Carbon	107	108½
Chi. Subways	3½	3½*	Nat'l Car., pfd.	118½	119

BOSTON.

	Feb. 28.	Mar. 7.		Feb. 28.	Mar. 7.
Am. T. & T.	141¼	142	Mex. Tel.	4	4
Cum. Tel.	150⅛	150¼*	Mex. Tel., pfd.	6	6*
Edison E. Ill.	247½	247½	N. E. Tel.	136	137
Gen. Elec.	154¼	155½	W. T. & T.	14*	16
Mass. E. Ry.	18	18¼*	W. T. & T., pfd.	88½*	88
Mass. E. R., pfd.	83*	83½			

* Last price quoted.
Shares sold are for week of Feb. 28 to March 5.

Financial Notes.

Chicago City & Connecting Railways Bonds.—The new $22,000,000 issue of collateral trust bands made by the recently organized Chicago City & Connecting Railways was offered for sale in Chicago and New York on Feb. 26. The first day's sale reached the $5,000,000 mark, and the price was 95. The total issue will be secured by stocks and bonds of the Chicago City Railway Company, Calumet & South Chicago Railway Company, Southern Street Railway Company, Hammond, Whiting & East Chicago Railway Company and Chicago & Western Railway Company, being the the case of the stocks the entire capital issue of each company except the Chicago City Railway Company, and being 94 per cent of the entire capital stock of that company. These securities are issued by corporations owning and operating street railways in the southern division of the city of Chicago and vicinity and having a trackage of 407 miles. The control of these deposited securities is vested in Elbert H. Gary, Albert J. Earling and Samuel M. Felton.

Kings County Electric Light & Power Company.—It is said that the stockholders who fully subscribed for the $2,500,000 of debenture bonds which were issued March 1 by the Kings County Electric Light & Power Company have paid more than $2,000,000 into the treasury of the company. The terms of the subscription made one-half payable March 1 and the other half Sept. 1, but it seems that the stockholders have in large numbers prepaid the September assessment. This gives the company a large working capital at the present time, which the management says is sufficient to meet the needs of all extensions and improvements which have been planned and to pay for renewals. The Public Service Commission has not yet acted upon the application for $2,500,000 of bonds, the remainder of the $5,000,000 originally applied for.

Western Power Company.—The Western Power Company, of California, in its report for November announces that it is selling about 28,000 hp. The capacity of the plant as at present operated is 68,000 hp. At the present rates at which power is sold, it is estimated that the disposal of the entire output of the plant would result in an annual surplus of $1,241,000, or about 13.05 per cent on the cost of development. The names of the original syndicate which furnished the money for the development of the enterprise were: Edwin Hawley, B. F. Yoakum, Charles M. Pratt, of the Standard Oil Company; H. E. Huntington, Frank H. Ray, of the American Tobacco Company; C. A. Coffin, of the General Electric Company; Gordon Abbott, Henry L. Higginson, Clarence H. Mackay, George R. Sheldon and W. P. Bonbright.

Columbia Gas & Electric Company.—At the annual meeting of the Columbia Gas & Eelectric Company, of Cincinnati, last week the stock holders approved the contracts made with the Standard Oil Company, and elected the following directors: James C. Ernst, James M. Hutton, M. E. Mock, F. R. Williams, Charles E. Clark and C. R. Morley. A. S. White, president of the company, said that there was now a surplus of $1,013,000, after meeting all fixed charges and other liabilities. The company owns 60 per cent of the capital stock of the Union Gas & Electric Company. The company has paid to the Knickerbocker Trust Company, of New York, trustee for the bonds, $113,660 for the redemption of outstanding bonds to that amount.

United Metals Selling Company.—The voting trustees of the United Metals Selling Company have sent out notices to the effect that the voting trust agreement has been extended another five years. The trustees are: Adolph Lewisohn, William Rockekeller, U. H. Broughton, Jesse Lewisohn and Allen W. Evarts. The extension of this trust means that there will be no change in control of the company for the next five years. The company is selling agent for upwards of 600,000,000 lb. of copper a year; it has a capital of $5,000,000, and its shares are quoted at between 400 and 500.

Consumers' Power Company, Jackson, Mich.—The Railroad Commission of Michigan has been applied to by the Consumers' Power Company for permission to increase its capital stock from $7,500,000 to $12,500,000 and to issue $35,000,000 in bonds. This company was organized by the Hodenpyl-Walbridge and E. W. Clark & Company interests to take over the following light and power companies: Grand Rapids-Muskegon Power Company, Grand Rapids Edison Company, Jackson Light & Power Company, Pontiac Power Company, Flint Electric Company, Saginaw Power Company, Bay City Power Company and the Au Sable Power Company.

Chicago Subway Reorganization.—Some announcement is expected in the near future with regard to the reorganization of the Chicago Subway Company and its subsidiary concerns. The first step will probably be to put the telephone system into shape for extension. The first new money that is raised will be for that purpose, and will be secured from the $2,000,000 receivers' certificates which were authorized a short time ago. After the telephone system is in working order, the freight traction line will be put in shape to earn its own way.

American Telephone Company Financing.—The management of the American Telephone & Telegraph Company announces very explicitly that no financing will be done during all of 1910, and banking interests that are friendly to the company say that no additional financing will be required until August, 1911. It is understood that this condition of the holding company is brought about by the issues of securities made by the operating company. These, it is said, will aggregate $50,000,000, and will provide for all the needs for the coming eighteen months.

Chicago Telephone Company.—The Chicago Telephone Company has paid to the city of Chicago $132,698 as a 3 per cent gross earnings' tax for the second half of 1909. The statement showed total earnings of $4,423,298.

American Company Buys Mackay Stock.—Theodore N. Vail, president of the American Telephone & Telegraph Company, has officially announced that his company is the purchaser of the 82,000 shares of its own stock, which was recently sold by the Mackay Companies to a syndicate of bankers. The cash paid for the entire block was between $11,500,000 and $12,000,000, or something more than $140 per share. This is a trifle less than the market price. Mr. Vail in his statement in regard to the transaction says: "This block is not for sale, but was secured with the idea of utilizing it this summer, in exchange for stocks of several subsidiary companies being financed and regrouped in accordance with the plan to confine physical property of operating companies to established State lines. There is no basis for assertions that a rate war between Western Union and Postal Telegraph companies is impending. So far as Western Union is concerned, nothing of the kind is thought of, and we have every expectation of continuing the same relations as in recent years. Any contention will be in the way of improvement of service and we hope to make it interesting for them in these lines. The American Telephone Company, through affiliation with Western Union, is planning ultimately to greatly increase the use of the telegraph for business and social purposes. We expect to afford the Postal the same advantage of handling telegraph messages over telephone wires as to Western Union. As Western Union has a larger plant, which reaches more p'aces, it will probably do a somewhat larger business. Telegraph rates are as low as commensurate with a fair profit, and there is no expectation of making any radical change in schedules."

Pennsylvania Railroad Report.—The report of the Pennsylvania Railroad Company for 1909 showed an increase in gross earnings of the lines east of Pittsburgh of $17,267,656. This statement was very satisfactory. One of the most important features of the report was the announcement that the total expendiure on the tunnels and New York terminal up to date had been about $102,000,000, and that some further millions would be necessary before the work was entirely completed. The company, however, is not asking for any new financing. Not far from half the cost of this immense work—in round numbers about $45,000,000—has been paid out of the surplus profits of the company within the past eight years. This was done without any lessening of the dividends for the stockholders. It is believed that the earnings of the company will show a substantial increase when the new tunnels are ready for operation in the fall.

Colorado Telephone Company.—The annual report of the Colorado Telephone Company for 1909 shows that the concern is in a very healthy condition. E. B. Field, the president, says in his report that at the end of the year the company had in service in Colorado and New Mexico 75,046 exchange telephones, an increase in the number of subscribers during the year of 6,079. The total miles of exchange lines was 171,989, an increase of 12,391 miles during the year. The total miles of toll lines was 22,832. During the year there was charged to construction $594,813.

Otis Elevator Company Bonds.—The stockholders of the Otis Elevator Company will hold a special meeting March 21 to authorize an issue of $3,500,000 of 5 per cent convertible bonds, and to provide for an increase in the capital stock from $6,500,000 to $10,000,000 to establish a fund for the bonds conversion. Preferred and common stockholders will be permitted to subscribe for the new bonds at 97½. The proceeds of the bonds will be used for refunding the floating indebtedness, and for furnishing additional working capital.

York Haven Water & Power Company.—A receiver has been appointed for the York Haven Water & Power Company, a $3,000,000 corporation of York Haven, Pa. Edwin F. Baker, secretary and manager of the company, was named as receiver. The company's plant on the Susquehanna River supplies energy for commercial purposes to York, Harrisburg and Steelton. The receivership is attributed to the drought during the last Summer, and to a suit brought by the York Haven Paper Company, claiming prior water rights and asking damages.

New West Virginia Traction.—A charter has been issued by the State of West Virginia to the Fairmont & Pittsburgh Railroad Company, capitalized at $1,000,000, to construct an electric railway from Fairmont to Blacksville, thence to Waynesburg and thence to Pittsburgh; also a line from Fairmont to Mannington, thence to Morgantown and back along the Monongahela River to Fairmont.

Northwestern Gas & Electric Company.—The Northwestern Gas & Electric Company, which operates in Walla Walla, Wash., and Pendleton, Ore., shows gross earnings for the 11 months which ended Nov. 30, 1909, of $209,914, and net earnings of $118,366. The latter is an increase of $6,577 over the same period in the previous year.

Montreal Transit Development.—The Montreal Elevated & Underground Railway Company was organized last week, with an authorized capital of $20,000,000, to build elevated and underground railways in that city. A number of well-known Canadian and American capitalists are interested in the new project.

DIVIDENDS.

American Smelting & Refining Company, quarterly, preferred, 1¾ per cent, payable April 1; common, 1 per cent, payable April 15.

Brockton & Plymouth Street Railway Company, preferred, semi-annual, 3 per cent, payable March 15.

Chicago City Railway Company, quarterly, 2½ per cent, payable March 30.

Dallas Electric Corporation, preferred, semi-annual, 3 per cent, payable April 11.

Houghton County (Mich.) Traction Company, semi-annual, preferred, 3 per cent; common, 2½ per cent, payable April 1.

Interborough Rapid Transit Company, quarterly, 2¼ per cent, payable April 1.

New York & Queens Electric Light & Power Company, preferred, quarterly, 1¼ per cent, payable March 1.

North American Company, quarterly, 1¼ per cent, payable April 1.

Portland (Ore.) Railway, Light & Power Company, preferred, quarterly, 1¼ per cent, payable April 1.

Safety Car Heating & Lighting Company, quarterly, 2 per cent, payable April 1.

REPORTS OF EARNINGS.

	Gross earnings.	Expenses.	Net earnings.	Charges.	Surplus.
Aurora, Elgin & Chicago:					
January, 1910	$101,784	$77,998	$23,786	$31,964	*$8,178
January, 1909	99,637	61,938	37,699	28,189	9,510
Capital Traction Company, Washington:					
Year 1909	2,024,484	918,373	1,135,405	293,026	842,379
Year 1908	1,831,810	793,141	1,062,833	290,947	771,886
Indiana Union Traction Company, Anderson, Ind.:					
Year 1909	2,103,019	1,113,429	989,590	948,756	40,834
Year 1908	1,902,330	1,058,745	843,585	854,249	*10,664
Kings County Electric Light & Power Company:					
January, 1910	393,217	168,305	224,912	106,271	118,641
January, 1909	350,706	148,511	202,195	96,415	105,780
Peoria (Ill.) Railway Company:					
Year 1909	642,669	339,839	302,830	.....	.....
Year 1908	593,391	291,169	302,195	.....	.....
Portland (Ore.) Railway, Light & Power Company:					
January, 1910	431,011	182,044	248,967	128,996	119,971
January, 1909	339,226	185,877	153,349	116,771	36,578
Ottawa Electric Railway Company:					
Year 1909	677,357	470,072	247,285	49,430	197,855
Year 1908	616,229	416,789	199,440	39,038	160,402
Twin City Rapid Transit Company, Minneapolis:					
January, 1910	583,963	302,631	281,231	140,229	141,102
January, 1909	525,660	285,825	239,836	133,963	105,873
Rocky Mountain Bell Telephone Company:					
Year 1909	1,855,689	1,332,467	523,222	441,654	81,568
Year 1908	1,628,030	1,317,462	310,568	415,564	*104,996
Western United Gas & Electric Company, Aurora, Ill.:					
Year 1909	790,637	412,458	378,179	162,078	216,101
Year 1908	751,941	395,868	356,073	158,244	197,829

* Deficit.

General News

Construction News.

CONWAY, ARK.—It is reported that plans are being considered to increase the equipment of the municipal electric light plant this summer.

FORT SMITH, ARK.—Preparations are being made by the Fort Smith & Interurban Railway Company to commence work in the near future on its proposed electric railway, which will extend from Fort Smith to Bonanza, Jenny Lind and Greenwood, a distance of 25 miles. George Sengel, of Fort Smith, Ark., is president of the company.

MAMMOTH SPRINGS, ARK.—The Hynson Brothers Telephone Company has purchased the plant and holdings of the South Fork Telephone Company, embracing lines to Hardy, South Fork and Morriston, Ark.; also a line to Thayer, Mo., and the local system in Mammoth Springs. The purchase adds 75 miles of country lines to the Hynson Brothers system.

MURFREESBORO, ARK.—Negotiations are under way between the Whitecliffs Portland Cement Company and the Pike County Water Company, by which the latter is to furnish the cement company with 2500 hp to operate its plant in Little River County, 30 miles distant. The plant of the Pike County Water Company is to be located on the Little Missouri River, three miles from Murfreesboro. Claudius Jones is president of the power company.

BELL, CAL.—The citizens of Bell have petitioned the Los Angeles Gas & Electric Company to extend its electric and gas service to this town.

LOS ANGELES, CAL.—The Board of Supervisors will receive bids until March 28 for a franchise giving the privilege to construct and operate an overhead transmission system on certain highways in the county for a term of 30 years.

NEEDLES, CAL.—The Needles Light & Power Company is contemplating extensive improvements to its plant, which will include the construction of a concrete power house and the installation of an additional engine and generator.

NEVADA CITY, CAL.—It is reported that George E. Fitzgerald, of Nevada City, Cal., is in the market for machinery for an electric power plant, air compressor and other apparatus.

PETALUMA, CAL.—Preparations are being made by the Petaluma & Santa Rosa Railway Company to extend its railway from Forestville to Guerneville, which, it is understood, will eventually be extended to the ocean.

ASPEN, COL.—The Colorado Power Company, represented by H. A. House, of Pueblo, Col., has filed for record with the County Clerk notice of locations for three large reservoirs and two sites for dams on the Roaring Fork River. The dams will have a capacity of 33,000,000 cu. ft., and will be used for power and irrigation purposes.

BOULDER, COL.—The Central Colorado Power Company has commenced work on the extension of its transmission line from the Nederland dam through the Roger's patent, where various mining properties will be operated, to the Wolf Tongue properties, thence to the Primos Mill, and from there to the Boulder County Mill at Cardinal. It is said that the line will be extended to Caribou this summer.

GOLDEN, COL.—The Coors Brewing Company is reconstructing its power plant and installing alternating equipment, including two 100-kw, 440-volt, three-phase, 60-cycle General Electric turbo-generator sets. The plant supplies electricity for lamps and motors for its various buildings.

IDAHO SPRINGS, COL.—The power plant at the Marshall-Russell tunnel, at Empire station, eight miles from this city, was badly damaged by fire Feb. 27, causing a loss of from $10,000 to $12,000.

LONGMONT, COL.—The City of Longmont is contemplating the construction of a hydroelectric power plant in connection with the $160,000 addition to its water works, now under way. It is proposed to locate the plant a few miles north of Lyons at a point where there is a drop of 425 ft. in the city water supply. The additional cost for storage is said to be very little, and it is estimated that about 1000 hp can be developed on the domestic water supply at this point.

MONTROSE, COL.—The City Council has appointed a committee to investigate the cost of lighting the city. Municipal ownership of the plant is favored.

COLCHESTER, CONN.—The T. M. Russell Engineering & Supply Company, of Middletown, Conn., has the contract for installing the new electric plant for the Colchester Electric Light Company. The work includes 80 street lamps and about eight miles of wiring; also wiring of residences and stores.

NEW BRITAIN, CONN.—The Housatonic Power Company (which has been formed to take over and operate the light and power department of the Connecticut Company) has applied to the Board of Public Works for permission to erect transmission lines on certain streets in New Britain for the purpose of transmiting electricity to the brick plant of Stiles & Reynolds Company in Berlin. The Stiles & Reynolds Company has decided to operate its plant by electricity and will install two 70-hp motors.

SOUTH COVENTRY, CONN.—Sufficient funds have been pledged to light the streets of the village for one year. The service will be furnished by the Rockville-Willimantic Lighting Company, which will also furnish electricity for residential and commercial lighting. The street lighting system will include about 25 incandescent street lamps at the rate of $16 each per year.

DOVER, DEL.—The contract for wiring and electric work for State Capitol has been awarded to the Garrett & Miller Company, of Wilmington, Del.

WILMINGTON, DEL.—It is reported that the Water Commissioners have decided to utilize the flow of water of the new reservoir in Brandywine to generate electricity.

FORT DADE, FLA.—Bids will be received at the office of the quartermaster, Fort Dade, Fla., until April 5 for construction of reinforced-concrete guardhouse, including plumbing, wiring and electrical fixtures, and construction of concrete storehouse and oil house. Plans and specifications will be furnished on application, for which a deposit of $5 will be required to insure return of same.

JACKSONVILLE, FLA.—The Board of Bond Trustees is considering a bond issue of approximately $1,000,000, the proceeds to be used for municipal improvements, of which $275,000 may be used for the construction of a new electric light plant. It is proposed to make the new plant the main station and use the present power house for a distributing station.

ALBANY, GA.—Announcement has been made that the Albany Power & Manufacturing Company proposes to construct an auxiliary steam plant, to cost $50,000, work on which will begin immediately. The new plant will increase the output of the company from 24,000 hp to 100,000 hp. Louis Joerissen, of Atlanta, Ga., has been elected president and manager to succeed S. D. Pickett, of Albany.

ATHENS, GA.—James White, owner of the Star Thread Mills, has organized a company under the name of the James White Power Company, for the purpose of constructing a hydroelectric power plant at Barnett Shoals, where it is proposed to develop about 4000 hp at a cost of $250,000. The plant will furnish electricity to operate the White Star Mills, which will take about 500 hp, and other industrial plants, and also for lamps. The dam will be 800 x 43 ft., with a 500-ft. rollway. Contract for construction of the dam has been awarded to the Ambursen Hydraulic Construction Company, of Boston, Mass.

ATLANTA, GA.—The Atlanta Northern Railway Company, operating an electric railway from Atlanta to Marietta, is reported to be contemplating changing its system from direct to alternating-current during the coming summer. Several substations will be erected along the route and its cars will be equipped with 75-hp motors.

EDISON, GA.—The citizens are reported to have voted to issue $8,000 in bonds, the proceds to be used for the installation of an electric light system. C. J. Jenkins is Mayor.

JACKSON, GA.—The construction of a third hydroelectric power plant on the Oculmulgee River in Butts County is under consideration. The proposed plant, it is said, will be located at Smith's Mills and will be built in connection with the Middle Georgia Interurban Railway by Captain W. F. Smith and associates.

MARSHALLVILLE, GA.—The Elberta Crate Company, recently organized, is contemplating the construction of an electric light plant and water works system; also cotton seed compresses and gins. J. M. Simmons is manager.

WEST POINT, GA.—It is reported that the Castle Cotton Mills, Ltd., has decided to locate in West Point, Ga., and proposes to erect a plant, the equipment of which will include 100,000 spindles, 2400 looms, etc., equipped for electric motor drive. The company will be capitalized at $1,000,000. C. R. Makepeace & Company, of Providence, R. I., will be the architects. For further information address William T. Lang, president of the Lang Manufacturing Company, West Point, Ga.

IDAHO FALLS, IDAHO.—We are informed that Louis C. Kelsey, of Salt Lake City, Utah, civil engineer, has been engaged to design and superintend the construction of a hydroelectric power plant and water-works system at Idaho Falls, Idaho, to cost approximately $100,000.

RUPERT, IDAHO.—The Secretary of the Interior has awarded contracts in connection with electrical power to be furnished by the United States to distributers in the towns of Heyburn, Rupert and Burley, Idaho, as follows: To Fred N. Victor, as trustee for the Rupert Electric Company, for electricity to be delivered at the town of Rupert; to Ernest Beardsley Skinner for electricity delivered at the town of Heyburn and the village of Burley. In each case a detailed schedule of rates to be paid to the United States is provided under the specifications and each bidder guaranteed that each calendar year from and including Jan. 1, 1912, until the termination of the 10-year contract the annual payment to the United States shall not be less than $1,500. Until that time payments are to be made for the power actually used. The power is to be furnished from the plant at the Minidoka dam for the energy in excess

of the amount required by the Government for pumping and other purposes of the irrigation project. The amount of power to be furnished each town is not to exceed 300 kw from June 1 to Sept. 1, and to exceed 1500 kw from Sept. 1 to June 1, provided that in case one or more of the towns do not desire the use of the full amount of power allotted to it the United States shall have the right to reduce the amount furnished to such town to the amount desired and paid for, and transfer the surplus to some other town, where it is needed, by giving three months' notice.

CHICAGO, ILL.—The Crawford Sash & Door Company is contemplating the installation of an engine and generator in its plant.

CHICAGO, ILL.—The Brodin Manufacturing Company is contemplating the construction of a new factory in Chicago, Ill., for the manufacture of stove pipe, ventilators, etc., which will be equipped for electric-motor drive.

CHICAGO, ILL.—It is reported that the North Shore Electric Company will increase its capital stock from $4,000,000 to $4,500,000 in May. The company, it is said, has decided to extend its system to the territory northwest from Libertyville, and west from Waukegan.

MURPHYSBORO, ILL.—The Murphysboro Electric Railway Company is planning to extend its railway from Murphysboro to Herrin, Du Quoin, Harrisburg, Pinckneyville and back to Murphysboro, forming a loop, surveys for which will be made at once. A. B. Minton is president.

EAST CHICAGO, IND.—The Hubbard Steel Company, it is stated, is planning to install a complete power plant in the near future.

FORT WAYNE, IND.—The Municipal Electric Light Department is in the market for several carloads of pine poles and an installment of wire, to be used in connection with extensions to the plant. During the past month 129 new customers have been added to the commercial service.

GARY, IND.—The local telephone exchange building was destroyed by fire February 24, causing a loss of about $75,000.

INDIANAPOLIS, IND.—Owing to the inequalities in rates for electricity furnished for lighting the buildings under the supervision of the Board of Public Safety, the board has decided to ask for bids for the service. The prices range from 4½ cents to 12½ cents per kw-hour.

JEFFERSONVILLE, IND.—The United Gas & Electric Company has purchased a site on which it will erect a new receiver at a cost of about $27,000. The company contemplates other improvements and installation of machinery, which will involve an expenditure of about $50,000 additional.

SEYMOUR, IND.—The property of the Seymour Home Telephone Company was recently sold under order of the court to Edward Cady, of Toledo, Ohio.

WINONA LAKE, IND.—The Winona Interurban Railway Company is reported to be contemplating the construction of an extension between Bremen and Milford, a distance of 14 miles, work on which will begin in the near future. J. B. Crawford, of Warsaw, Ind., is purchasing agent.

ALBIA, IA.—The Southern Iowa Traction Company, recently incorporated in New Jersey, proposes to equip the Centerville & Albia Railroad, which was formerly operated as a steam railroad between Centerville and Albia, for electrical operation. The company is capitalized at $300,000, and the incorporators are: G. G. Moore, K. Lathrop and S. W. Ladd, of Detroit, Mich., and T. W. Atwood, of Caro, Ia.

INDEPENDENCE, IA.—The contract for repairs and improvements for the municipal electric light and water plants was awarded to the Westinghouse Electric & Manufacturing Company, of Pittsburg, Pa., for $4,733.

BAXTER SPRINGS, KAN.—Arrangements are being made by the Baxter Springs Electric Light & Water Company for enlarging its plant to furnish electricity to operate the new electric railway which will extend from Baxter Springs to the lead and zinc mines of Oklahoma. The work will include the installation of a direct-connected engine. An ice plant will also be installed. Dr. Charles M. Jones is proprietor.

TROY, KAN.—The city has decided to install an electric lighting system. O. C. Winzer, Mayor, and Henry Calnan are negotiating with the Atchison Railway, Light & Power Company in regard to the company furnishing electricity to operate the system. It has not yet been decided whether to install a power plant or secure energy from Atchison or St. Joe.

LOUISVILLE, KY.—The Louisville Railway Company is reported to be contemplating the construction of an eight-mile extension from Fern Creek to Mt. Washington.

LOUISVILLE, KY.—Preparations are being made by the Louisville Lighting Company for extensive improvements and additions to its power plant at Fourteenth Street and Broadway which will involve an expenditure of about $150,000. It is expected that work will begin within a short time. D. X. Murphy & Brother, of Louisville, Ky., are architects. F. M. Sackett is president of the company.

NEW ORLEANS, LA.—Bids will be received by the New Orleans Railway & Light Company until March 18 for the construction of a brick and steel building to be used as a substation at Iberville and Pierce streets. Specifications are on file at office of the company. Hugh McCloskey is president of the company.

PORTLAND, MAINE.—Bids will be received at the office of the constructing quartermaster, 655 Congress Street, Portland, Maine, until April 2, 1910, for the construction, plumbing, heating and electric lighting of the following buildings at Fort Williams, Maine: One administration building, plan 169-C (brick); one guard house, plan 206 (brick); two sets field officers' quarters, plan 236 (brick); two double sets captains' quarters, plan 256 (concrete); one double set lieutenants' quarters, plan 260 (brick); one bakery, plan 217 (brick); one quartermaster's storehouse, plan 198 (brick). Plans, specifications, blank forms for proposals, etc., furnished on application and are on file for examination in the office of the chief quartermaster, Department of the East, Governor's Island, N. Y., and at office of constructing quartermaster, 263 Summer Street, Boston, Mass. Captain C. F. Humphrey, Jr., is constructing quartermaster.

HILLSBORO, MD.—Plans are being considered by the Farmers' and Merchants' Telephone Company for extensive improvements and extensions to its system, which will involve an expenditure of about $50,000. It is proposed to reconstruct and extend the system through Caroline, Talbot and Queen Anne's counties.

AMESBURY, MASS.—The machinery of mills Nos. 4, 5 and 7 of the Hamilton Woolen Company is now driven by electricity supplied by the new electric power plant recently installed.

BOSTON, MASS.—The proceeds of the 3600 shares of stock authorized by the stockholders of the Massachusetts Lighting Companies will be used for payment of the property of the Northampton Gas Light Company, instead of the North Traction Gas Light Company, as reported in the issue of March 3.

GARDNER, MASS.—The Gardner Electric Light Company has applied to the State Board of Gas and Electric Light Commissioners for permission to increase its capital stock from $65,000 to $170,000, the proceeds of $25,000 to be used to enlarge its plant and distributing system and the remainder to pay off outstanding indebtedness.

PITTSFIELD, MASS.—Plans have been prepared for enlarging the power house of the Stanley plant, which will involve an expenditure of about $50,000 and will double the output of the plant.

SWANSEA, MASS.—The Fall River Electric Light Company, of Fall River, Mass., has submitted a proposition to the town officials, offering to furnish 40 lamps for street lighting at the rate of $1,000 per year.

BAY CITY, MICH.—The W. Gregory Company, of Bay City, Mich., it is reported, will be in the market for an air compressor and pneumatic appliances, together with some electrical equipment.

CHESANING, MICH.—The Town Council is considering the question of constructing a hydroelectric power plant to furnish electricity to operate the municipal electric plant. The report submitted by Oliver Dales, engineer employed to investigate the matter, estimates the cost of the plant at $30,000, which would include the purchase of the Chapman rights in the river, the purchase of equipment and furnishing the village with 25 arc lamps in the business section and 75 tungsten lamps for the residence section. While the cost of the water project is more than would be required for a new steam plant, it is estimated that the village would save $1,800 annually in operating expenses. The Commonwealth Power Company has made a proposition offering to furnish arc lamps for street lighting at the rate of $60 per lamp per year in return for a long-term franchise, and will make other concessions, including the furnishing of electricity to operate the water works.

DETROIT, MICH.—A low-pressure steam turbine which will operate an alternator of about 800 kw will be put in service this year by the Detroit Copper & Brass Rolling Mills, of Detroit, Mich.

FLINT, MICH.—Arrangements are being made by the Weston-Mott Company, of Flint, Mich., for the installation of additional motors in its plant.

HAMTRAMCK, MICH.—At the spring election franchises for public service utilities, including street car, gas and electric lighting, amounting to nearly $2,500,000, will be voted upon.

IRONWOOD, MICH.—A. E. Appleyard, of Boston, Mass., and H. P. Harmon, of Portland, Maine, are negotiating for the purchase of the properties of the street railway, electric light and water power companies operating in Ironwood and Hurley. If the deal goes through it is proposed to erect transmission lines and extend the hydroelectric service to operate the plants taken over. The same interests control the public service utilities in Ashland, Wis., and own water powers on the Bad and White rivers. The construction of an electric railway connecting Ashland and the Gogebic range country is under consideration.

JACKSON, MICH.—The Consumers' Power Company has petitioned the State Railroad Commission for permission to increase its capital stock from $7,500,000 to $12,500,000 and to issue $35,000,000 in bonds, the proceeds to be used to take over companies and improve and operate the properties. The companies included in the merger are: The Grand Rapids-Muskegon, Grand Rapids Edison Company, Jackson Light & Power Company, Pontiac Power Company, Flint Electric Company, Saginaw Power Company, Bay City Power Company and the Au Sable Power Company. It is said that other companies will be taken over by the company in the near future.

KALAMAZOO, MICH.—Brush, Anderson & Ammerman, engineers, of Detroit, Mich., are reported to have been engaged by the Board of Education to prepare plans and specifications for a new heating, ventilating and power plant for the Lake Street School in Kalamazoo, Mich. The plant is to be installed in June. H. H. Buckhout is secretary.

LANSING, MICH.—The Water and Light Commissioners are reported

to be considering the purchase of an additional unit for the municipal electric light plant.

LANSING, MICH.—W. E. Tench & Company, of Detroit, Mich., have been awarded the contract for the construction of the Lansing & Owosso Electric Railway, a distance of 25 miles. The construction company has established headquarters at Morrice, Mich.

PAW PAW, MICH.—The City Council has granted a franchise to William Plumb and H. H. Tucker to construct and operate an electric railway in Paw Paw. It is proposed to extend the railway to Kalamazoo, Lawrence, Hartford and Benton Harbor.

OWOSSO, MICH.—At a special election held March 2 the citizens voted to grant franchises to the Commonwealth Power Company, of Jackson, Mich., and the Lansing & Northeastern Railway Company, of Lansing, Mich. Negotiations have been closed by the Commonwealth Power Company for the purchase of the Owosso Corunna Electric Company, which operates the electric railway between Owosso and Corunna. The railway of the Lansing & Northeastern Company has been completed as far as Morrice.

BIWABIK, MINN.—The Village Council is considering the question of establishing a day service in connection with the municipal electric-light plant.

MINNEAPOLIS, MINN.—The Twin City & Lake Superior Railway Company, of Minneapolis, Minn., has filed in St. Paul, Minn., a trust deed for $4,000,000 in favor of the American Trust & Savings Bank, of Chicago, Ill. The proposed railway will extend from Minneapolis to Duluth and Superior. About 60 miles of the route has been graded. L. N. Loomis, of Minneapolis, Minn., is president.

NEW ULM, MINN.—Plans are being prepared by H. F. Biomquist for the installation of ornamental curb lamps on Minnesota Street in New Ulm.

OAK PARK, MINN.—The Minnesota State Board of Control has awarded the contract for the construction of buildings at the Minnesota State Prison in Oak Park, Minn., to O. H. Oleson, of Stillwater, Minn., for $1,332,947; for mechanical equipment to the Hawley Casey Company, of Chicago, Ill., for $543,400.

ORTONVILLE, MINN.—Preparations are being made to organize the Minnesota River Improvement & Power Company, and articles of incorporation will soon be filed with the Secretary of State. The company will be capitalized at $1,000,000, and proposes to construct three dams along the Minnesota River, which will control absolutely the flood waters of the river. It is proposed to erect the first dam at Ortonville, at the source of the Minnesota River, one at Lac qui Parle and the third at Redwood Falls. It is expected to develop 25,000 hp. A. B. Kaercher is temporary president.

PIPESTONE, MINN.—It is reported that the Northwestern Telephone Exchange Company is contemplating rebuilding its local system at a cost of about $25,000.

ROCHESTER, MINN.—The Zumbro River Power Company, which is planning to construct a hydroelectric power plant on Zumbro River, 15 miles from Rochester, has submitted a proposition to the City Council offering to furnish electricity to operate the municipal electric-light system for $27,500 per year.

MALDEN, MO.—The city is reported to have voted to issue $20,000 in bonds, the proceeds to be used for extensions and improvements to the municipal electric light plant and water works system.

GREAT FALLS, MONT.—Bids will be received by the City of Great Falls, Mont., until March 21 for the installation at the pumping station of two electrically driven centrifugal pumps having a rating of 2,000,000 gal. every 24 hours.

GREAT FALLS, MONT.—The ways and means committee of the City Council in its report submitted to the Council does not favor the proposition of the construction of a dam across the Missouri River for the purpose of furnishing power to operate a municipal electric-light plant. The Council has decided to secure estimates of the cost of installing a steam plant near a coal mine where electricity could be generated and transmitted to the city.

TERRY, MONT.—The construction of an electric light plant in Terry is under consideration.

ASHLAND, NEB.—The Plattsmouth Telephone Company is reported to have secured a site on which it will erect a new telephone exchange building. The company is also planning to rebuild most of its rural lines.

COLUMBUS, NEB.—Bids will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until April 14 for construction complete, including plumbing, gas piping, heating apparatus, electric conduits and wiring, of the United States post office at Columbus, Neb., in accordance with drawings and specifications, copies of which may be obtained from the custodian of site at Columbus, Neb., or at the above office. James Knox Taylor is supervising architect.

CRAB ORCHARD, NEB.—The Village Board has decided to call an election March 11 to vote on the proposition to establish an electric light plant in Crab Orchard.

FAIRBURY, NEB.—The citizens are considering the question of submitting to a vote the proposition to issue bonds to the amount of $135,000 for the purpose of purchasing the present plant in Fairbury or for the construction of a new plant.

SIDNEY, NEB.—The capital stock of the Sidney Electric Company is reported to have been increased to $50,000.

JOHNNIE, NEV.—The Johnnie Mining & Milling Company is planning to equip its plant at Johnnie for electrical operation and will probably be in the market for motors in the near future.

RHYOLITE, NEV.—The Eclipse Development Company, of Rhyolite, Nev., it is understood, will require some electrical equipment this spring.

SWEETWATER, NEV.—The Walker River Electric Power Company is contemplating the construction of a temporary power plant or partial development at a cost of about $1,000,000, bids for construction of which will be called for in the near future. F. H. Whiting is engineer.

NASHUA, N. H.—The Nashua Card, Gummed & Coated Paper Company has recently installed a 250-hp Skinner engine direct connected to a Fort Wayne generator which will furnish electricity to operate its plant.

FORT HANCOCK, N. J.—Sealed proposals will be received by C. J. Goodier, constructing quartermaster, Fort Hancock, N. J., until April 6 for the construction of a pumping plant and installation of machinery. Plans can be seen at the above office or at the office of the chief quartermaster, Department of the East, Governor's Island, N. Y. A deposit of $25 will be required to guarantee the return of the plans.

ALBANY, N. Y.—Governor Hughes has signed the Merritt bill authorizing an appropriation of $500,000 for a site and the construction of a power house and coal pockets for furnishing light, heat and power for the State Capitol and new educational building. The sum of $5,000 is available immediately. The Trustees of Public Buildings are also authorized to enter into a contract for a site and construction of plant.

BROOKLYN, N. Y.—Bids will be received by the Commissioner of Water Supply, Gas and Electricity, 13-21 Park Row Building, New York, N. Y., until March 16 for furnishing, installing, maintaining and reserving for use of the high-pressure fire service all apparatus and equipment necessary for generating and transmitting 1830 kw electricity, three-phase, 6600-volt, 25-cycle, furnished and delivered under terms of this contract, from March 16 to Dec. 31, 1910, both inclusive, at each of the high-pressure fire-service pumping stations located in the Borough of Brooklyn, at Furman and Joralemon streets and at Willoughby and St. Edwards streets, respectively. Blank forms may be obtained at Room 1319, Park Row Building, New York, N. Y. Henry S. Thompson is commissioner.

BUFFALO, N. Y.—The Washburn-Crosby Company, of Buffalo, N. Y., it is reported, will install several alternating-current motors with a rating of about 500 hp each.

BUFFALO, N. Y.—The Superior Motor Vehicle Company, of Buffalo, N. Y., which is reported to be preparing plans for the construction of a new factory, will require equipment for a new power house, including engines and boilers or steam turbines, heaters, pumps, condensers, generators, motors, switchboard and auxiliary apparatus. A separate power house will be erected.

NEW YORK, N. Y.—The Snare & Triest Company, 143 Liberty Street, New York, N. Y., is reported to have purchased a site on the Hackensack, N. J., meadows, east of the Passaic River, where it proposes to erect during the coming summer a plant for fabricating structural steel. It is understood that the plant will be equipped for electric motor drive throughout.

NEW YORK, N. Y.—Bids will be received by the Commissioner of Water Supply, Gas and Electricity, Department of Water Supply, Gas and Electricity, 13-21 Park Row, New York, N. Y., until March 16 for furnishing, installing, maintaining and reserving for use of the high-pressure fire service all apparatus and equipment necessary for generating and transmitting 7250 kw of electricity, three-phase, 6600-volt, 25-cycle, furnished and delivered under terms of this contract, from March 16 to Dec. 31, 1910, both inclusive, at each of the high-pressure fire-service pumping stations located in the Borough of Manhattan, at Oliver and South streets and at Gansevoort and West streets, respectively. Blank forms may be obtained at Room 1319, Park Row Building, New York, N. Y. Henry S. Thompson is commissioner.

NIAGARA FALLS, N. Y.—The Queenstown & Niagara Electric Railway Company, recently organized, proposes to construct an electric railway between Queenston and Niagara-on-the-Lake along the lower Niagara Gorge to Lake Ontario, a distance of seven miles.

NORTH SYRACUSE, N. Y.—The Public Service Commission, Second District, has authorized the North Syracuse Light & Power Company to install an electric light plant in the village of North Syracuse and to exercise franchises granted to the company. The company proposes to install a transformer in the electric power station of the Syracuse & South Bay Electric Railroad, which will furnish electricity for the local service.

OSWEGO, N. Y.—It is understood that an agreement has been reached between the city of Oswego and the Minnetto-Meriden Company relative to the location of dams on the Oswego River. It is proposed to erect a 20-ft. dam in Oswego and an 18-ft. dam at Minnetto. It is said that the company and the city will work together to secure locations for the proposed dam.

SYRACUSE, N. Y.—Plans are being prepared by the Syracuse Lighting Company for extensive improvements in both its gas and electric systems which will involve an expenditure of about $350,000 and include the construction of about five miles of gas mains ond construction of underground conduits for electrical wires.

FAYETTEVILLE, N. C.—The properties and holdings of the Fayette-

ville Gas & Electric Light Company have been transferred to Thomas Badger, Jr., who purchased the plant at foreclosure sale for $11,000. The new owner, it is said, proposes to make extensive improvements to the system.

HIGH POINT, N. C.—The North Carolina Public Service Corporation has purchased a site in High Point for its proposed substation, and also perfected plans for the construction of one and one-half miles of additional track to the local street car system.

RUTHERFORDTON, N. C.—It is reported that the Isothermal Traction Company, recently incorporated, is contemplating the construction of a hydroelectric power plant on the Broad River. Kenneth S. Finch, of Charlotte, N. C., is president of the company.

WADESBORO, N. C.—Plans are being considered for the construction of a hydroelectric power plant on Rocky River, 13 miles from Wadesboro. A dam 500 feet in length will be built, with submerged power house. It is estimated that about 6000 hp can be developed at a cost of about $600,000. Walter E. Brock is interested in the project.

WILSON, N. C.—Application has been made to the Town Council by B. F. Lane, representing Northern capitalists, for a franchise to construct and operate an electric street car system in Wilson.

BEACH, N. D.—The Council has granted a franchise to George Dhrysler, of Wadena, Minn., to install an electric light system. It is understood that a 125-hp plant will be installed.

VALLEY CITY, N. D.—It is reported that a company has been organized to construct an electric railway from the business section of the town to the new station of the Northern Pacific Railroad.

BARNESVILLE, OHIO.—Bids will be received until March 17 by F. Waldo Hilles, village clerk, for lighting the streets, public grounds and municipal buildings with electricity for a term of 10 years.

BELLEFONTAINE, OHIO.—The capital stock of the United Telephone Company has been increased from $300,000 to $400,000.

CLEVELAND, OHIO.—Sealed proposals will be received by the County Building Commission of Cuyahoga County, 425-427 Garfield Building, Cleveland, Ohio, until March 23, 1910, for installing complete refrigerating machinery for drinking water system for the Cuyahoga County court house, Cleveland, Ohio, in accordance with plans and specifications prepared by Hollis French and Allen Hubbard, engineers, Albany Building, Boston, Mass., which can be seen at the office of the Cuyahoga County Building Commission or at the office of the engineers, Boston, Mass. Proposals must be made on blanks furnished by the commission. Copies of plans can be secured from the commission upon deposit of $30, which will be refunded when plans are returned. John J. Boyle is secretary pro tem of commission.

DAYTON, OHIO.—Plans are being considered by the Dayton & Troy Electric Railway Company for extensive improvements to its system, which include increasing the output of the power house, overhead work and track work.

MARION, OHIO.—The Marion Shoe Company, it is reported, will require power equipment for its new factory, including a 75-kw generator and motors, Corliss or automatic engine and boiler of from 125 to 150 hp.

MOUNTAIN VIEW, OKLA.—The city on March 1 voted in favor of the proposition to issue $20,000 in bonds for the construction of an electric-light plant; $5,000 for extensions to water-works system, and $20,000 for sewer system. Plans have been prepared by the O'Neil Engineering Company, of Dallas, Tex. D. E. McBride is city clerk.

CELILO, ORE.—The Celilo Milling & Power Company has purchased 80 acres of land from I. H. Taffe at Celilo Falls, on which, it is said, the company will erect a power plant during the coming summer.

PANAMA.—Sealed proposals will be received by the general purchasing officer of the Isthmian Canal Commission, Washington, D. C., until April 4 for the year ending June 30, 1911, for furnishing electrical material, including transformers, fixtures, fittings, batteries, carbons, table, wire, mica, rubber sheets, molding, wire rope, attachments, slate, tape, insulating material, soldering material, etc. Blanks and general information relating to this circular (No. 565) may be obtained at the above office or at the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 55 National Realty Building, New Orleans, and 1086 North Point Street, San Francisco, Cal. Captain F. C. Boggs is general purchasing officer.

CRISTOBAL, PANAMA.—Two sets of frequency changers will be installed in the power house at Cristobal, to change electricity transmitted from the plant at Gatun from 25 to 60 cycle, to be used for lamps in Colon and Cristobal. Each set consists of a 6600-volt, three-phase, 25-cycle synchronous motor, operating a 200-kw, 2300-volt, three-phase, 60-cycle generator.

HOMER CITY, PA.—The Homer City Electric Company, recently incorporated, is contemplating the construction of an electric plant in Homer City. The company is now negotiating with the Council with a vew of furnishing electricity for street lamps, and if sufficient encouragement is given will install a plant here and furnish electrical service in Homer and adjoining territory. The company is capitalized at $5,000 and the officers are: C. Miller, president; John M. Landfair, secretary, and Charles Landfair, treasurer.

LANDIS STORE, PA.—The capital stock of the Mountain Telephone Company of Landis Store has been increased from $5,000 to $15,000, the proceeds to be used to build new lines.

MEADVILLE, PA.—Plans are being considered by the Meadville Telephone Company for improvements to its local service, which will include the installation of new cables, erection of new wires, etc. John H. Wright is general manager.

NEW CASTLE, PA.—Announcement has been made that the proposed electric railway from New Castle to Mercer, with a branch to Sharon will be financed by J. G. White & Company, of New York, N. Y. The company will be capitalized at $1,000,000, and it is stipulated that $130,000 must be taken by parties living in the territory. Right-of-way and franchises have already been secured. Robert M. Russell is president of the company.

PHILADELPHIA, PA.—Plans have been prepared by Chief McLaughlin, of the Electrical Bureau, for improving the lighting system in the business district of the city, which calls for the installation of 5370 lamps as compared with 913 now in service in the district bounded by the Delaware and Skuylkill Rivers and Vine and South Streets. The cost of maintaining the new lamps is estimated at $471,873. The new system will require 2685 new posts at an approximate cost of $120,825. Under the new system all lamps would be maintained by underground wires.

TITUSVILLE, PA.—The City Council has granted the Titusville Central Railroad Company a franchise to construct an electric railway from Titusville to Corry. Surveys have been made and work will soon commence on construction of the road. W. J. Smith, of Titusville, Pa., is president.

WAYNESBORO, PA.—The Chambersburg, Greencastle & Waynesboro Electric Railway Company has recently increased its capital stock to $2,500,000 and the bonded indebtedness to the same amount. The company is contemplating the construction of an extension from Pen Mar to Highfield, Monterey and Blue Ridge Summit.

SAN JUAN, P. R.—Sealed proposals will be received at the office of the Commissioner of the Interior, San Juan, until March 15 for furnishing all materials and constructing a telephone line complete from Guayman to the Patillas dam site, a distance of about 10 miles. The cost of the work is estimated at about $1,300. Plans and specifications may be seen at the above office or at the office of the Irrigation Service, Guayama, P. R. B. M. Hall is chief engineer of the Porto Rico Irrigation Service.

WOONSOCKET, R. I.—Plans are being prepared for the construction of the Nyanza Mills in Woonsocket, and include the erection of a mill 275 ft. long by 135 ft. in width and four stories high, with an initial installation of 25,000 spindles. The plant will be equipped for electrical operation. The capital stock is placed at $500,000. John W. Farwell is president.

GREAT FALLS, S. C.—Plans are being prepared by the Republic Cotton Mills Company, which is now constructing a 25,000-spindle plant in Great Falls, which include the construction of two more mills, the three factories to have a total capacity of 100,000 spindles and complement of looms. About 2500 hp will be required to operate the plant. Robert S. Mebane, of Graham, N. C., is president of the company.

ABERDEEN, S. D.—Preparations are being made by the Aberdeen Street Railway Company for the construction of four miles of track, contract for which will be let in the near future. The company will soon let contracts for construction and equipment of a power plant in Aberdeen. Charles N. Herreid, of Aberdeen, S. D., is president and general manager.

HOWARD, S. D.—C. A. Laurson is reported to have applied for a franchise to construct and operate an electric-light plant in Howard.

HOWARD, S. D.—Messrs. Steen and Gibson, of Cripple Creek, Col., are reported to have been granted a franchise by the City Council to construct and operate an electric light system in Howard.

NASHVILLE, TENN.—The Nashville & Adairville Railway Company has been granted an amendment to its charter giving it the privilege of extending its proposed railway into Kentucky and connecting at Owensboro with the Illinois Central Electric Railway, of Canton, Ill.

TRENTON, TENN.—At an election to be held March 26 the proposition to issue $12,000 in bonds for the construction of a municipal electric light plant will be submitted to a vote.

ALVIN, TEX.—The local electric-light plant is reported to have been purchased by P. H. Manaker. It is understood that the plant will be enlarged.

AUSTIN, TEX.—The contract for installing electrical equipment in the Littlefield Building, Austin, Tex., has been awarded to the Standard Electrical Construction Company, of New Orleans, La. The cost of the work is estimated at $15,000.

JOURDANTOWN, TEX.—A company headed by E. M. Tom, of Jourdantown, Tex., has been organized in Jourdantown to install an electric light and power plant. The company is capitalized at $30,000. F. P. Wallace is general manager.

MARFA, TEX.—It is reported that the Marfa Power Company will be reorganized and extensive improvements made to the property. The plant and holdings of the company were recently sold at a foreclosure sale.

SAN ANGELO, TEX.—The San Angelo Street Railway Company is extending its electric railway to East Angelo and is preparing to construct a belt line through the city, for which a franchise has been granted by the City Council. A bonus of $14,000 is being raised by the residents

of San Angelo Heights as an inducement to the company to extend its railway to that suburb.

SEGUIN, TEX.—A company is being organized in Seguin, which will be known as the Seguin Water Power Company, for the purpose of developing the water power of the falls in Guadalupe River, about two miles above this city. The company will be capitalized at $100,000.

SHERMAN, TEX.—The property of the Grayson County Telephone Company was sold under order of the United States Court, Feb. 23, to T. W. Cole, acting for the reorganization committee, for $50,000. It is understood that improvements will be made to the systems at once in Sherman and Denison. C. A. Shock has acted in capacity of receiver.

PRICE, UTAH.—At a special election held Feb. 15 the citizens voted to issue $9,000 in bonds, the proceeds to be used for the construction of an electric light plant. It is proposed to erect a plant to cose $15,000, work on which will begin as soon as the weather will permit.

SALT LAKE CITY, UTAH.—The Salt Lake City & Ogden Railway Company has contracted with the Telluride Power Company for electricity to operate its electric railway for one year. Simon Bamberger is president and general manager of the railway company.

BARRE, VT.—Plans are being considered by Moore Brothers, of Barre, Vt., for opening up a new quarry in New York State, for which it is understood that considerable machinery will be required, including boilers, Corliss or slide-valve engine, air compressor, pneumatic tools and a jaw or a gyratory crusher, with power transmitting apparatus.

FALLS CHURCH, VA.—The question of improving the present lighting system in Falls Church is under consideration by the Town Council.

RICHMOND, VA.—The City of Richmond is negotiating with the Virginia Railway & Power Company for the use of the company's underground conduits for the distributing lines of the new municipal light and power plant.

WINCHESTER, VA.—The contract for construction of steam power plant for the Winchester & Washington City Railway Company (bids for which were opened Feb. 28) was awarded to Henry S. Rippel, 1-7 Clay Street, Baltimore, Md. P. O. Keilholtz is consulting engineer.

NACHES, WASH.—We are informed that the Natches Irrigation & Power Company is not in the electric business, but is operating a small local irrigation ditch, and is in no sense a power company. The Naches Light & Water Company was incorporated for the purpose of supplying water for domestic purposes in Naches, and does not deal in electricity at all, and is not in the market for any machinery. J. E. Boyle is proprietor of both plants.

RITZVILLE, WASH.—Application has been made to the City Council by the Washington Southern Telephone Company for a franchise to install a new telephone system in Ritzville. The system will be automatic and extend from Harrington to Sprague, thence to Portland, Ore., and later to Seattle and Tacoma, with connections east to St. Paul, Minn.

TACOMA, WASH.—The contract for the construction of the headworks and tunnel for the Nisqually power plant was awarded by the Board of Public Works Feb. 21 to Wright, Sweeney & Cummings, of Tacoma, Wash., for $655,225.

BENTON, WIS.—Arrangements are being made by the Baxter Mining Company for the construction of a new power house and concentrating plant in Benton.

CHETEK, WIS.—The Citizens' Telephone Company, recently organized, it is said, will purchase the present telephone plant and make extensive improvements to same, connecting with Bloomer, Chippewa Falls and Eau Claire.

LA CROSSE, WIS.—The La Crosse & Winona Traction Company is contemplating double tracking some sections of its system, which will involve an expenditure of about $30,000.

ST. CROIX FALLS, WIS.—Plans are being prepared by the Minneapolis General Electric Company for improvements to its plant in St. Croix Falls, which will involve an expenditure of about $400,000. Two turbines will be installed increasing the output of the plant from 10,000 to 15,000 hp, and the construction of a second transmission line to Minneapolis, for which steel towers will be used. Work will commence as soon as the weather will permit.

MAYVILLE, WIS.—The capital stock of the Mayville Telephone Company has been increased from $24,000 to $60,000.

MILWAUKEE, WIS.—The new plant of the Kleckhefer Box Company, of Milwaukee, Wis., will be equipped for electric motor drive throughout.

PLAINFIELD, WIS.—Preparations are being made by the Union Telephone Company to extend its service to Leola, eight miles distant.

WHEATLAND, WYO.—At an election to be held April 22 the proposition to issue bonds to the amount of $15,000 for the construction of an electric light plant will be submitted to a vote.

CAMROSE, ALTA., CAN.—Propositions will be received by O. B. Olson, secretary and treasurer of the town of Camrose, until April 15 for the installation of an electric-light and power plant in this town on a 10-year franchise basis.

DUNNVILLE, ONT., CAN.—At an election held recently the by-law to appropriate $10,000 to purchase a site and buildings for the Wilheim Telephone Manufacturing Company was carried.

GALT, ONT., CAN.—The Town Council, it is reported, has decided that the price ($85,000) asked by the Galt Gas Light Company for its plant is excessive, as it exceeds the engineer's estimate by $32,000. The Council now proposes to buy the overhead distributing system of the company for $12,000 and secure electricity from the transmission system of the Hydro-Electric Power Commission.

HAMILTON, ONT., CAN.—A by-law has been voted appropriating $10,000 for equipping the Hamilton Hospital for the Insane to utilize electricity furnished by the Hydro-Electric Power Commission.

LONDON, ONT., CAN.—The citizens have voted in favor of the by-law appropriating $25,000 for equipping the London Hospital for the Insane to utilize electricity furnished by the Hydro-Electric Power Commission.

NIAGARA FALLS, ONT., CAN.—Arrangements are being made by the Electrical Development Company of Ontario, Ltd., to increase the capacity of its generating plant at Niagara Falls, Ont., from 50,000 hp to 85,000 hp in the near future. The cost of the work is estimated at about $500,000. The company controls the Toronto & Niagara Power Company.

PORT ARTHUR, ONT., CAN.—The Port Arthur & Fort William Street Railway has purchased an 800-amp-hour storage battery and booster from the Gould Storage Battery Company. The company has recently installed a 300-kw Allis-Chalmers-Bullock motor-generator set. N. C. Pilchor, of Port Arthur, is purchasing agent.

ST. THOMAS, ONT., CAN.—The City Council has awarded the contract for installing equipment to utilize electricity furnished by the Hydro-Electric Power Commission from Niagara Falls to the Canadian Westinghouse Company, of Hamilton, Can., for $18,000. The machinery is to be installed within five months.

TORONTO, ONT., CAN.—Plans are being prepared for the erection of an electric plant at the Ontario Agriculture College, at a cost of $15,000. A cold storage plant will be built at the Eastern Dairy School to cost $3,000.

TORONTO, ONT., CAN.—Contracts for oil switches and transformers for the municipal electric power plant have been awarded as follows: Canadian General Electric Company for one transformer at $8,800; Canadian Westinghouse Company, two transformers, one at $5,436 and the other, $3,130; Allis-Chalmers-Bullock, two transformers at $12,676 and $10,550, respectively.

MONTREAL, QUE., CAN.—The Montreal Underground & Elevated Railway Company has applied for a charter for the purpose of constructing and operating by electricity or other motive power underground or elevated railways through the city and island of Montreal, and to construct tunnels, viaducts, subways, bridges and also to acquire and develop water powers and any sources of energy and to build and operate transmission lines therefrom to the city of Montreal. The company is to be capitalized at $20,000,000. Lt.-Col. T. B. Butler is attorney for the applicants.

AMECA, JALISCO, MEX.—Preparations are being made by the Magistral-Ameca Copper Company for the installation of an electric plant in its mine in this district, to furnsh electricity to light the mines and reduction mills. James P. Harvey is general manager.

PUEBLA, MEX.—Arrangements are being made by the Tramways, Light & Power Company, of Puebla, for extensions and improvements to its system.

New Industrial Companies.

THE AMERICAN ELECTRICITY ECONOMIZING COMPANY, of New York, N. Y., has been chartered by G. N. Ansell, C. O. Alberga, of New York, N. Y., and C. I. Friedman, of Brooklyn, N. Y. The company is capitalized at $100,000 and proposes to manufacture and deal in electrical apparatus and appliances.

THE AUTO BATTERY & ELECTRICAL COMPANY, of Buffalo, N. Y., has been chartered with a capital stock of $20,000 by Theodore P. Meinhard, Charles B. Bleyler and Montford Ryan, all of Buffalo, N. Y. The company proposes to manufacture electrical appliances and devices for automobiles.

THE LOUIS J. BERGDOLL MOTOR COMPANY, of Camden, N. J., has been incorporated by Louis J. Bergdoll, F. R. Hansell and John A. MacPeak, all of Camden, N. J. The company is capitalized at $500,000 and proposes to manufacture motor vehicles, etc.

THE BUILDERS' ELECTRIC COMPANY, of Atlanta, Ga., has been chartered with a capital stock of $5,000 by William T. Proctor, R. H. Hunt, Jr., and others, to manufacture and sell all kinds of electrical apparatus and supplies.

THE CARRIGAN & LYNN CONSTRUCTION COMPANY, of Birmingham, Ala., has been organized with a capital stock of $20,000 by C. O. Lynn, J. C. Carrigan and E. F. Emerson, of Birmingham, Ala. The company proposes to do a general construction business.

THE ELECTRIC SALES COMPANY, of Baltimore, Md., has been chartered with a capital stock of $6,000 by E. Vernon Murphy, J. Wistar Huey and H. M. Cosh.

THE FEDERAL MOTOR COMPANY, of Buffalo, N. Y., has been chartered by H. A. Dann, of Lancaster, N. Y.; W. C. Barker and T. C. Coons, of Buffalo, N. Y. The company is capitalized at $100,000 and

proposes to manufacture machinery to generate gas or electricity, etc.; also the manufacture of vehicles of all kinds, gasoline motors, etc.

GUILD & GARRISON, of Brooklyn, N. Y., has filed articles of incorporation with a capital stock of $100,000 to manufacture and deal in mechanical, electrical and chemical apparatus. The incorporators are: W. R. Lynch, E. Jenkins and W. J. Guild, of Brooklyn, N. Y.

THE HUB MOTOR COMPANY OF AMERICA, of New York, N. Y., has been incorporated with a capital stock of $1,000,000, to manufacture and sell engines, motors and machinery of all kinds. The incorporators are: C. A. Spofford, of New York, N. Y.; P. S. Smith and C. Berg, of Philadelphia, Pa.

THE INTERSTATE CONTRACTING COMPANY, of Jersey City, N. J., has been chartered with a capital stock of $125,000 as general contractors and engineers by Stockton Randolph Ferris. J. H. Chris. Mitchel and Frank J. Anderson, all of Jersey City, N. J.

THE LUND ENGINEERING & CONSTRUCTION COMPANY, of Jersey City, N. J., has filed articles of incorporation with a capital stock of $500,000 as mechanical engineers, machinists, etc. The incorporators are: H. O. Coughlan, L. H. Gunther and J. R. Turner, all of Jersey City, N. J.

THE PEARSON-BURGESS COMPANY, of St. Albans, W. Va., has filed articles of incorporation with a capital stock of $10,000 for the purpose of doing a general engineering business. The incorporators are: H. C. Pearson, W. A. Burgess, C. J. Pearson and others.

THE BRICE H. REED COMPANY, of Elkhart, Ind., has been incorporated for the purpose of manufacturing electrical specialties and electrical goods and commodities of all kinds. Bruce H. Reed is president and C. E. Ingersoll secretary of the company.

O. M. STIMSON & COMPANY, of Chicago, Ill., have been incorporated with a capital stock of $2,500 to do a general engineering and contracting business. The incorporators are: O. M. Stimson, Charles J. Nash and William S. Miller.

THE TESLA OZONE COMPANY, of New York, N. Y., has been incorporated with a capital stock of $400,000 for the purpose of manufacturing electrical apparatus for sterilizing foods, etc.; also to manufacture and sell electro-hygienic and sanitary apparatus and supplies. The incorporators are: W. Kelley, W. H. Macmurdo and E. B. Yale, of New York, N. Y.

THE UNITED HORSE SUBDUER COMPANY, of New York, N. Y., has been incorporated with a capital stock of $50,000 to manufacture and deal in electrical vehicles; mine, transport and deal in coal, iron, steel and other mineral substances. The incorporators are: P. J. Minck, of Brooklyn, N. Y.; J. A. Martin, of New York, N. Y., and W. A. Cooper, of Jersey City, N. J.

THE YOUMANS-RADCLIFFE CONSTRUCTION COMPANY, of New York, N. Y., has filed articles of incorporation with a capital stock of $25,000 for the purpose of doing a general contracting and construction business. The incorporators are: R. Condon, R. T. Stork and N. G. Psaki, of New York, N. Y.

New Incorporations.

EUREKA SPRINGS, ARK.—Articles of incorporation have been filed for the Eureka Springs Electric Company by Henry C. Brent, A. M. Barrow and Justin D. Bowersock. The company is capitalized at $100,000 and proposes to biuld an electric street car line in Eureka Springs.

VALLEJO, CAL.—The Vallejo Traction Company has filed articles of incorporation with a capital stock of $200,000. It is understood that the company proposes to construct an electric railway through the eastern section of Vallejo to the White Sulphur Springs. The incorporators are: Joseph Levison, M. H. Meacham, Theodore Bell, E. Z. Hennessy, all of Napa, Cal., and C. G. Doty, of Vallejo, Cal.

WILMINGTON, DEL.—The Wilmington Automatic Telephone Company has been incorporated with a capital stock of $1,000,000 by William T. Spring and F. H. Hensel.

PEORIA, ILL.—The Peoria Southern Railway Company has been chartered for the purpose of constructing an electric railway from Peoria to Pekin by H. E. Chubbuck, H. J. Vance, H. C. Dillon, and W. J. Achelpohl, of Peoria, Ill., and W. H. Carnahan, of Champagn, Ill.

PEORIA, ILL.—The Peoria Northern Railway Company has been incorporated to construct an electric railway from Peoria along the Illinois River through Chillicothe, Sparland, Lacon and Henry to Bureau. The incorporators are: H. E. Chubbuck, H. J. Vance, H. C. Dillon and W. J. Achelpohl, of Peoria, Ill., and W. H. Carnahan, of Champaign, Ill.

LANSING, MICH.—Articles of incorporation have been filed for the Lansing & Northeastern Electric Railway Company by G. G. Moore, K. Lathrop, and S. W. Ladd, of Detroit, Mich., and T. W. Atwood, of Caro, Mich. The company is capitalized at $500,000 and proposes to construct an electric railway from Lansing to Owosso, with two branches, one from Morrice via Durant to Flint, the other from Owosso to Saginaw. The proposed railway will be 30 miles in length.

DEERFIELD, MONT.—Articles of incorporation have been filed for the Deerfield Telephone Company with a capital stock of $12,000 by M. A. Johnson and others.

LINCOLN, NEB.—Articles of incorporation have been filed for the Omaha Western & Lincoln Railway Company to construct an electric railway from Omaha to Hastings, Neb., with a branch to Lincoln. The officers are: Frank F. Schaaf, president and general manager; J. B. Erwine, secretary, and A. P. Tilly, treasurer. Headquarters of the company are located in Lincoln.

PORT ANGELES, WASH.—The Port Angeles Power & Electric Company has been incorporated by Frank Mackean, of Seattle, Wash., and R. H. Bethel. The company is capitalized at $80,000.

SPOKANE, WASH.—The Commonwealth Power Company has been incorporated with a capital stock of $5,000,000 by J. E. Burns, E. F. Waggoner, F. W. Dewart, L. H. Brown and Carl Ultes, Jr. The company proposes to develop water power on the Spokane, Columbia and Snake Rivers which will be utilized in connection with an extensive irrigation project.

SPOKANE, WASH.—The Spokane Railway & Power Company has filed articles of incorporation with a capital stock of $2,000,000 to construct and operate electric railways in Washington. The incorporators are: H. L. Moody, D. M. Drumheller and Alfred Coolidge.

WENATCHEE, WASH.—The Wenatchee Valley Railway & Power Company has filed articles of incorporation with a capital stock of $2,500. The incorporators are: H. A. Chapin and others.

MANNINGTON, W. VA.—The People's Utility Company has been granted a charter to construct and operate an electric railway in Mannington and other parts of Marion and Wetzel counties. The company is capitalized at $5,000 and the incorporators are: W. R. Martin, C. R. Phillips, W. T. Smith, of Mannington, W. Va.; and I. D. Morgan, of New Martinsville, W. Va.

NEW RICHMOND, WIS.—Articles of incorporation have been filed for the St. Croix Telephone Company with a capital stock of $25,000 by John Padden and A. Tobin.

WHITEHALL, WIS.—The Whitehall Mill & Power Company has been chartered with a capital stock of $25,000 by Thomas E. Thompson, Mathias S. Olson, John Vogsted and Evan Langberg.

MONTREAL, QUE., CAN.—Articles of incorporation have been filed for the Central Canada Power Company by J. C. Hickson, K. C. V. M. Drury, S. B. Hammond, G. C. Papineau and L. A. David, of Montreal. The company is capitalized at $5,000,000 and proposes to construct and operate electric and hydraulic power plants and erect transmission lines for the transmission and distribution of electricity.

Personal.

PROF. LOUIS A. HERDT, of the department of electrical engineering at McGill University, Montreal, has been elected chairman of the electrical section of the Canadian Society of Civil Engneers.

MR. ARLIN D. MILLER has resigned his position as manager of the Reno (Nev.) Traction Company to become manager of the Central California Traction Company, with headquarters at Stockton.

MR. W. T. GENTRY has been re-elected president of the Southern Bell Telephone Co. Mr. Gentry has been connected with the company for 27 years, and two years ago was promoted to the presidency.

MR. W. N. SMITH, first assistant chief engineer of the National Electric Lamp Association, delivered a lecture on the manufacture of incandescent lamps at the Pennsylvania State College on March 3.

MR. JOHN C. PARKER, electrical engineer for the Rochester (N. Y.) Railway & Light Company, has been appointed non-resident lecturer in electric energy transmission at the University of Michigan, Ann Arbor, Mich.

MR. CHARLES A. BERNIER, formerly general superintendent of the Winona (Minn.) Railway & Light Company, has been appointed superintendent of electric lighting of the Helena (Mont.) Light & Railway Company.

MR. H. E. MILTON, superintendent of the Paris Telephone Company, is visiting the United States for the purpose of studying American telephone systems, with the object of recommending improvements in the Paris service.

MR. PARKER HAYWARD DAGGETT has left the employ of the American Telephone & Telegraph Company, New York, to accept the appointment as professor of electrical engineering at the University of North Carolina, Chapel Hill, N. C.

MR. JULIAN C. SMITH, who for several years has been general superintendent of the Shawinigan Water & Power Company, Montreal, has been appointed also chief engineer of the company and will hereafter have full charge of all engineering undertakings of the company.

MR. HUGO REISINGER is in Berlin arranging the details for an American art exhibition to be held there in connection with the Royal Academy exhibition. Mr. Reisinger has made the selection of American paintings to be shown, which will number about 200 canvases.

MR. EUGENE CREED, sales manager of the Toronto Electric Light Company, Limited, has just completed a tour of the central stations of Detroit, Chicago, Rochester, Buffalo, and in a number of smaller cities, the object of which was to study the latest American "new-business" methods.

MR. L. L. NUNN, who was the organizer of the Telluride Power Company and has held the title of general manager since its inception, has been elected president to succeed Mr. James Campbell. Mr. Nunn will continue as general manager of the company, with headquarters at Provo, Utah.

MR. L. E. MARSHALL, for several years connected with the Commonwealth Edison Company, of Chicago, lately in charge of the automobile division of the contract department, has resigned to accept a position with the Woods Motor Vehicle Company, Chicago, manufacturers of electric automobiles.

MR. W. A. TEN WINKLE, who has been for several years publicity manager of the Electric Controller & Manufacturing Company, of Cleveland, has resigned to accept the position of special representative with the Penton Publishing Company. Mr. Ten Winkle will continue to make his headquarters in Cleveland.

MR. A. S. SPIEGEL has opened an office at 331 South Clinton Street, Chicago, as a consulting engineer in telephony and special electric-sign work. Mr. Spiegel has been for seven years with the experimental department of the Chicago Telephone Company. A number of his inventions are now in use by the Bell telephone companies.

MR. E. B. KIRK has resigned as general manager of the Atlantic Shore Line Railway, Kennebunkport, Me., and has sailed for London, Eng., to become connected with the operating department of J. G. White & Company, Ltd., in charge of electric light and railway properties at Para and Manaos, Brazil. Mr. Kirk is a graduate of Purdue University and since his graduation in 1897 has had a very wide experience in railway and electric light work in all parts of the country.

MR. ALEXANDER BACKUS disposed of his holdings in the Vulcan Steam Shovel Company, Toledo, Ohio, on March 1 and retired from the presidency after an active service of 20 years. The new owners and officers of the company are as follows: Mr. H. P. Eells, president, and Mr. G. F. Steedman, vice-president. Mr. Carl Horix, who has been acting as general manager for some time past, will continue in this capacity.

MR. J. M. SMITH, better known as "Buckeye" Smith to the lamp-buying public, has recently been appointed sales manager of the Moline Incandescent Lamp Company, of Moline, Ill. Mr. Smith was a pioneer in the application of electric lighting in textile mills, and entered the lamp business with an intimate knowledge of industrial illumination which speedily brought him success as a salesman when he became connected some years ago with the Buckeye Electric Company as its Eastern representative.

MR. FRANK A. VAUGHN, electrical engineer for the lighting department of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has resigned to open an office of his own as a consulting electrical engineer. Mr. Vaughn, who will continue to be located at Milwaukee, is a graduate of the electrical engineering department of the University of Wisconsin, class of 1896. He has been with the Milwaukee Electric Railway & Light Company practically ever since, and he leaves with the best wishes of all his old associates.

MR. E. J. KULAS, president of the Central Station Development Company, recently formed to advance the interests of central stations, has had a long and successful business career, though only now thirty years of age. Within the past six years he has held the positions of secretary and general manager of the Brilliant Electric Company, vice-president of the A. & W. Electric Sign Company, vice-president of the Conneaut Company, treasurer and general manager of the Pennsylvania Gas & Electric Fixture Company, president of the Tungstolier Company, and president of the Cleveland Gas & Electric Fixture Co.

MR. E. J. KULAS.

MR. W. H. WISSING.

MR. W. H. WISSING, vice-president and general manager of the Central Station Development Company, for twenty years prior to 1904 sold machinery, boilers, etc. From 1904 to 1909 he was in charge of the "New Business" department of the Union Electric Company of St. Louis, during which period he more than doubled the number of customers for the company. In 1909 he became vice-president and general manager of the Tungstolier Company, to which he added 700 new customers in a single year.

MR. ROBERT M. BABBITT, for some time Western manager for the *Electric Railway Journal*, with office in Chicago, has resigned and is now connected with the sales organization of the National India Rubber Company, of Bristol, R. I., with headquarters in New York City. Mr. Babbitt has many friends in the electrical and street-railway fields who will wish him success in his new connection. Mr. Babbitt is succeeded in his former work in Chicago by Mr. E. J. Hunt, who has been connected with the *Electric Railway Journal* for several years.

MR. GUSTAF HOLMGREN, formerly chief engineer of the alternating-current department of the All. Svenska Elektriska Aktiebolaget (Swedish General Electric Company) at Westeras, Sweden, is on a visit to the United States. Mr. Holmgren was five years with the engineering firm of Ernst Danielson, and nine years with the Svenska Elektriska Aktiebolaget. The 17,000-kva. slow-speed generator which the latter firm is now installing at the great nitrate works in Rjukanfos, recently described in these columns, and the great generators for Trollhattan, were designed by Mr. Holmgren. These machine are among the largest built, and are notable examples of the latest methods of cooling.

Obituary.

MR. CHARLES H. SCHERMERHORN, said to have been the oldest telegrapher in the world in point of service, died on March 3 in Plainfield, N. J. Mr. Schermerhorn was a son of Mr. Abraham Schermerhorn and was born at Hatboro, Pa., in 1833. He became a telegrapher at the age of 17 and was attached to the experimental station at New Hope, Pa., as a messenger boy. When the office opened for business he became an operator. From there he was sent to Princeton and later came to New York. He was put in charge of a telegraph office at the old Barnum Museum and subsequently was sent to Brooklyn, where he sent the first message from that place to New York. When the Civil War broke out he was assigned to the station at Camp Sewell, at Beverly, N. J., and there he formed the friendship of General Grant, who at times spent hours in the office sending and receiving war despatches. He also worked for General Sherman at the same place. He was a member of the Old Time Telegraphers' Association.

Trade Publications.

BLUE PRINTING MACHINES operated by means of electric arc lamps are briefly described in a folder issued by the Buckeye Engine Company, Salem, Ohio.

LIFTING MAGNETS.—Much interesting information concerning lifting magnets is contained in a folder issued by the Cutler-Hammer Clutch Company, Milwaukee, Wis.

TELEPHONES of the intercommunicating automatic key type are well discussed in an illustrated booklet issued by the Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

COPPER-CLAD STEEL WIRE.—The Duplex Metals Company, New York, has issued a booklet containing standard specifications for hard-drawn copper-clad steel wire and for copper-clad steel bond wires.

FEED-WATER REGULATOR.—The Northern Equipment Company, 408 West Indiana Street, Chicago, Ill., has issued a neatly printed catalogue giving much information in detail relating to the Copes regulator for maintaining a constant water level in steam boilers.

ELECTRIC SIGNS.—The Oliver Roto Company, 191 Fifth Avenue, Chicago, Ill., has issued an illustrated folder for calling attention to its sign equipped with moving lamps, which is said to cost only 3 cents per hour to operate, the consumption being from 250 to 475 watts, according to the size.

FANS, driven by motor of either the direct-current or the alternating-current type, are described, illustrated and listed in bulletin No. 5352 of the Western Electric Company, Chicago, Ill. The direct-current motors are series-wound commutator machines, while the alternating-current motors are induction machines.

SIGNS.—Flasher signs are described in bulletins Nos. 1, 3, 5 and 7 of the Reynolds Electric Flasher Manufacturing Company, 191 Fifth Avenue, Chicago, Ill. Bulletins Nos. 2 and 4 deal with revolving lamp signs, while an automatic time switch is described in bulletin No. 6 of the same company. Each bulletin contains a complete price list of the apparatus described.

TELEPHONE TRAIN DESPATCHING.—The Western Electric Company has issued in pamphlet form a reprint of an article entitled "Train Despatching by Telephone," written by Mr. C. H. Gaunt, superintendent of Telegraph of the Santa Fe System, for the *Santa Fe Employees' Magazine*. The pamphlet shows a list of 35 railroads that are now using the Western Electric telephones for train despatching.

OIL AND GAS BURNERS.—Catalogue No. 3 of the W. S. Rockwell Company, 30 Church Street, New York, deals with fuel oil and gas appliances, including fuel-oil burners, fuel-oil pumping systems, positive pressure blowers, and oil and gas furnaces for manufacturing purposes.

AIR COMPRESSORS of the motor-driven type are well discussed in illustrated publication No. 387 of the National Brake & Electric Company, Milwaukee, Wis.

ELECTRIC LAMPS.—The General Electric Company has issued a small pamphlet, No. 3907, descriptive of the Mazda Lamp. This lamp is said to be the most recent and improved development in high efficiency metal filament lamps. It represents the result of the combined research work and manufacturing experience of the laboratories and factories of the most important lamp manufacturers and inventors in the world, secured through the acquisition of the most improved processes.

ELECTRICAL SUPPLIES.—The Doubleday-Hill Electric Company, Pittsburg, Pa., has issued as its electrical supply catalogue No. 6, a 775-page publication devoted to all kinds of electrical supplies, which are illustrated, listed and briefly described. The supplies include electric lighting equipments, generating installations, wiring material, meters, lightning arresters, motors, controlling devices, fans, insulators, primary batteries, annunciators, heating devices, telephone and telegraph equipments.

HIGH-TENSION APPARATUS.—The Delta-Star Electric Company, Chicago, Ill., is distributing pages 3 and 4 of its loose-leaf January price list. Complete information is given on a line of new high-tension entrance tubes, pot heads and insulating compound. The technical data section of the price list is of exceptional interest in that it gives data on high-tension lines, sparking distance and the critical voltages at which corona effects occur. These price lists should be of exceptional interest to engineers designing high-tension installations.

RECORDING AMMETERS AND VOLTMETERS.—In bulletin No. 4706 of the General Electric Company are illustrated and described the company's Type CR recording ammeters and voltmeters. This type of instrument gives a clear, permanent record of the characteristics of the electric circuit to which it is applied, and will be found of value in locating trouble with electrical apparatus in proving the efficiency of machines and effectiveness of workmen, especially where the individual drive system has been adopted, and in determining the correct size and style of the new machine. The instruments are suitable for use on either alternating or direct current.

BUSINESS NOTES.

THE TOWER-BINFORD ELECTRIC & MANUFACTURING COMPANY, Richmond, Va., will move about April 1 into new quarters at 5 Governor Street, where it will have 30,000 sq. ft. of floor space for the conduct of its electrical jobbing business.

MR. FREDERIC H. KEYES, of the office of Sprague, Keyes & Jackson, consulting engineers, Boston, has investigated the plant of the Empire Paper Company, of Ithaca, N. Y., supmitted a report, and supervised the changes necessary to improve the conditions existing at this plant.

ARTHUR JONES COMPANY, formerly of 84 Van Buren Street, Chicago, announces its removal to 223 South Clinton Street (near Adams Street), in the same city. At the new location the company will have about 4000 sq. ft. of floor space and much better facilities for handling its increasing business in the buying and selling of new and second-hand electrical machinery. Mr. Arthur Jones has grown up in the electrical business in Chicago, and it is not strange that he is making a success in it.

THE PEIRCE DEPARTMENT of Hubbard & Co., formerly the Peirce Specialty Co., of Elkhart, Ind., has been moved into its new building, erected at the main works of Hubbard & Company, Pittsburgh, Pa. Mr. C. L. Peirce, Jr., manager of the department, states that: "Since last October, the volume of business in the Peirce line has broken all previous records and severely taxed the capacity of the Elkhart plant. This is doubled at the new plant, with provisions for further increasing it. The general galvanizing plant has also been doubled, in order to provide for the output of the Peirce Department, and therefore there will be no more of the vexing delays, as at Elkhart, when outside galvanizers were relied upon.

THE ROBINS CONVEYING BELT COMPANY announces that arrangements have been made for the removal of its executive offices and sales, engineering and purchasing departments to the twenty-sixth and twenty-seventh floors and both towers of the Park Row Building, 13 Park Row, New York. Occupancy of the new quarters will be completed by Saturday, March 12, 1910. This suite is one which was occupied by the company up to two years ago, when its general offices were removed to the works at Passaic, N. J., and a branch office opened in the Terminal Buildings at 30 Church Street, New York. The office at the Church Street address will now be discontinued and combined with the other offices in the Park Row Building.

THE BUFFALO FOUNDRY & MACHINE COMPANY has placed contracts for a large new machine shop, to cost $200,000. The building will be of steel and concrete construction, with traveling cranes in all the bays and galleries. A special study has been made to eliminate all hand handling. The cranes will be of a capacity to easily lift individual pieces weighing as much as 200 tons each. Orders have been placed for an exceptional machine tool equipment, all the tools having been ordered special so as to obtain the highest production and get an exceptionally large range of work. All the tools will be motor-driven, the motors being twice the size ordinarily used on the same machines. The entire plant will be operated by Niagara Falls power. This company is about to take up several additional lines of manufacture, and will continue to make a specialty of general jobbing machine work.

THE HEANY FIREPROOF WIRE COMPANY, York, Pa., has added a line of asbestos insulated and braided cords to its fireproof wires, these cords being intended for moving-picture machines and also for domestic use in connection with smoothing irons, toasters, etc. The cords are much neater in appearance than those in general use, and are heat, moisture and fire proof. They have been approved by the National Board of Fire Underwriters and also by the New York City Dept. of Water, Gas & Electricity. The cords are made with a patent mosture-proof insulation on the conductor and one layer of asbestos braid over the insulation, which latter, if desired, may be saturated with a moisture-proof compound, thus giving the cord a smooth, solid appearance combined with great flexibility. This insulation is applied to either the solid or flexible conductors and can be made of any thickness.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED MARCH 1, 1910.

[Conducted by W. F. Bissing, Patent Law, 2 Rector St., N. Y. City.]

950,473. TELEGRAPH BULLETIN PRINTER; G. L. Campbell and H. G. Davis, Williamsport, Pa. App. filed Nov. 11, 1908. For printing newspaper bulletins in page form by means of large type controlled by an electrical circuit. The type wheel is driven by an electrical motor.

950,502. OUTLET BOX; A. I. Appleton, Chicago, Ill., and O. C. Hoffmann, Buffalo, N. Y. App. filed Nov. 29, 1905. Junction box and switches and fuses having brackets with slots and screws extending therethrough.

950,520. ELECTRIC WINDING MECHANISM FOR TIMEPIECES; J. Steiger, Besancon, France, and J. Besancon, Le Chauz-de-Fonds, Switzerland. App. filed May 12, 1909. For periodically utilizing an electric current to actuate means for winding the movement of the time piece. Details.

950,579. APPARATUS FOR AGING LIQUORS; J. Seitz, Chicago, Ill. App. filed Sept. 21, 1907. A receptacle for containing liquor, an insulating support with positive and negative electrodes, pivoted thereto, and means for adjusting them to radiate outwardly from the support.

950,595. PROCESS OF REDUCING METALLIC OXID ORES; H. E. T. Haultain, Toronto, Ont., Canada. App. filed June 30, 1908. For reducing ores so that they may be treated in a finely divided condition by showering finely divided ore and carbon through a chamber containing a heated reducing gas into a bath of molten metal heated by electricity and burning the surplus gas.

950,599. ELECTRIC HEATER; M. D. McGerry, Grand Rapids, Mich. App. filed March 4, 1908. Comprises two air conduits with an electric feeding coil wound about the inner conduit, the latter of metal, with heat radiating fingers.

950,620. ELECTRIC CURLING-IRON HEATER; C. P. Harmon, Evanston, Ill. App. filed Sept. 30, 1909. For curling irons having means for covering the shell of the heater to prevent burning the hands by means of an obsolete spheroidal shell containing the heating coil.

950,623. ELECTRICAL SIGNAL FOR RAILWAYS; W. Kirkpatrick and F. W. Van Tuyl, Kansas City, Kan. App. filed Nov. 16, 1908. Means whereby two trains traveling in opposite directions are automatically operated to warn the engineers.

950,630. TROLLEY POLE; H. Brod, St. Charles, Mo. App. filed May 24, 1909. The pole has a broad face to engage the wire, and it may be attached or detached to a support carried by the car.

950,647. ELECTRICAL MEASURING INSTRUMENT; M. J. Wohl, New York, N. Y., and H. Hertzberg, Brooklyn, N. Y. App. filed March 20, 1908. A resistance heated thermostat operating a movable indicator, so as to indicate the maximum current flowing in the circuit.

950,650. CLUSTER LAMP SOCKET; R. B. Benjamin, Chicago, Ill. App. filed Feb. 8, 1908. The lamp holding structure or socket, with outward sleeve having an inward flange encountering the outside of the casing, a clamp in the sleeve, a clamp inside of the casing over an opening and means for connecting the clamp with the clamping arrangement in the sleeve to secure the sleeve upon the casing.

950,651. LAMP HOLDING DEVICE! R. B. Benjamin, Chicago, Ill. App. filed March 13, 1908. Electric lamp socket with leading in wires secured to binding posts and the lamp carrying part concealed at the base and completes the electrical connections.

950,652. CLUSTER LAMP SOCKET; R. B. Benjamin, Chicago, Ill. App. filed April 14, 1908. The base is insertable into a cap and carries binding terminals and a lamp engaging contact and a ring-shaped insulating base extends around the cap and is detachably secured thereto and carries the lamp holder.

950,669. TIN AND SHEET BAR HEATER; C. Hillman, New Castle, Pa. App. filed Feb. 4, 1909. Endless chains carry the material through the furnace and electrical heating coils heat the material.

950,688. APPARATUS FOR BONDING RAILS; C. L. Cadle, Cleveland, Ohio. App. filed Jan. 2, 1907. For bonding rails by the use of an electric current, so as to develop heat to solder, braze or weld a bonding member across a gap in the rails. Includes a rail clamp supported from a truck movable along the track, together with a member adapted to rest on the top of the rail, to make direct electrical contact therewith.

950,703. APPARATUS FOR PRODUCING OXIDS OF NITROGEN FROM THE AIR; F. I. Du Pont, Wilmington, Del. App. filed April 17, 1909. A container with an insulating lining, and electrodes for forming an arc and a rotory magnetic field outside of the container, which deflects the arc against the inner surface of the container.

950,709. STARTING DEVICE FOR ADJUSTABLE VAPOR APPARATUS; P. H. Thomas, East Orange, N. J. App. filed April 12, 1904. A vacuum electrical apparatus, including an exhausted container, electrodes, a cathode and means for permitting the movement of the container and for supporting it in vertical, horizontal and intermediate position, and a supplementary anode for co-operating with the cathode in all of said positions.

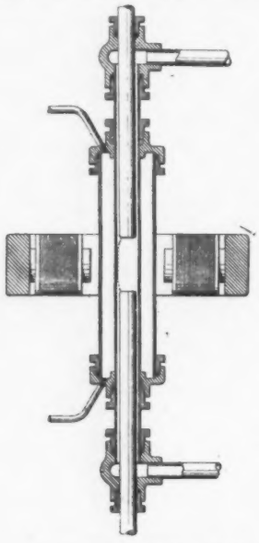
950,713. PLURAL LAMP SOCKET; R. B. Benjamin, Chicago, Ill. App. filed Oct. 1, 1907. A multiple socket for incandescent lamps, with an insulating base and contact piece, a body having a plurality of lamp-holding devices and a telescopic means for securing the base and body together.

950,714. ELECTRICAL TESTING APPARATUS; H. J. Blakeslee, Syracuse, N. Y. App. filed Feb. 23, 1909. For testing watt-hour meters by means of an alternating current transformer having a handle consisting of its secondary winding.

950,716. PROCESS OF BONDING RAILS; C. L. Cadle, Cleveland, Ohio. App. filed Jan. 2, 1907. First solders or brazes the bodies together and then raises them to a welding temperature by means of a voltaic arc.

950,718. LIFTING MAGNET; A. C. Eastwood, Cleveland, Ohio. App. filed Feb. 15, 1906. For protecting the magnetizing coil by means of a non-magnetic plate and a second non-magnetic plate covering the first plate to receive directly the impact of articles attracted there against.

950,760. ELECTRIC MERCURY ARC LAMP; J. M. Anck, Philadelphia, Pa. App. filed May 13, 1904. A starting device consisting



950,703.—Apparatus for Producing Oxids of Nitrogen from the Air.

of a tube containing mercury, an arcing electrode above it, and electric heater for boiling and vaporizing the mercury and causing contact with the arcing electrode.

950,777. METHOD OF PLATING TUBES, ETC.; W. H. Winslow, Chicago, Ill. App. filed Feb. 6, 1908. Deposits upon steel or iron tubing a uniform electric deposit for tubes for small boilers.

950,781. DETECTOR FOR WIRELESS COMMUNICATION; J. L. Hogan, New York, N. Y. App. filed Dec. 18, 1909. Ferro-silicon, consisting of a fused mixture of iron and silicon, is used.

950,784. PORTABLE APPARATUS FOR BONDING RAILS; W. A. Neff, Cleveland, Ohio. App. filed Aug. 24, 1908. Comprises a transformer which carries means for supporting it over the rail, the secondary terminals of the transformer including means which engage the rail.

950,842. MONOPOLAR VACUUM TUBE; F. A. Davis, Boston, Mass. App. filed March 15, 1909. For pathological examination of the mouth, having one end small enough to enter the mouth and throat, a neck portion and a vacuum chamber for the X-ray terminals.

950,845. ELECTRICAL BATTERY HOLDER; H. Engel, Holyoke, Mass. App. filed March 10, 1909. For holding a set of electric batteries by means of metallically connected arms with an arm of each bar having its location over and for engagement with one pole of a battery, while the other arm has its arrangement over and for engagement with a pole of another battery.

950,853. BURGLAR AND FIRE ALARM; B. Kohlen, Brussels, Belgium. App. filed Oct. 7, 1907. The safe to be protected is provided with a normally open circuit containing a bell, a resistance coil with an armature which is normally attracted and switched into a circuit of a battery, together with a continuous current comprising an electromagnet with double winding and another resistance coil, all contained in a box containing electrically controlled clock work, so as to notify of any attempts to steal the device or to disturb the circuits.

950,861. ELECTRIC BATTERY; W. Morrison, Chicago, Ill. App. filed Aug. 11, 1902. A battery with a negative element having a supporting surface, bromin in the electrolyte, which is electrically deposited upon the bottom of the cell, while the zinc is deposited upon the suitable support.

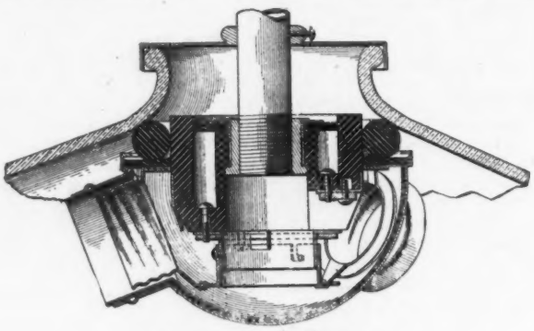
950,877. ELECTRIC FURNACE; J. Thomson, New York, N. Y. App. filed May 13, 1909. An electric furnace having a register of a constant make, with means for containing a plurality of electrodes and constructed to adjust itself automatically to thermal expansions for the purpose of maintaining a substantially constant intimacy of contact between the elements.

950,878. FURNACE; J. Thomson, of New York, N. Y., and F. A. J. FitzGerald, Niagara Falls, N. Y. App. filed May 13, 1909. A revolving electric furnace and a carbon resistance as a central core, its hearth formed into segments.

950,879. ELECTRIC FURNACE; J. Thomson, New York, N. Y. App. filed Sept. 1, 1909. A resistance for electric furnaces, consisting of a plurality of interlocking resistance plates of carbon.

950,880. ELECTRIC FURNACE; J. Thomson, New York, N. Y. App. filed Sept. 1, 1909. A revolvable electric furnace in which the resistance consists of interlocking disks which are concentrically fluted.

950,881. ELECTRIC FURNACE; J. Thomson, New York, N. Y. App. filed Sept. 1, 1909. A flat resistance for electric furnaces, consisting



950,713.—Plural Lamp Socket.

of wedged blocks which span the melting chamber and are supported wholly by the brick work at each end.

950,882. ELECTRIC FURNACE; J. Thomson, New York, N. Y. App. filed Sept. 1, 1909. A resistance for electric furnaces, consisting of a curved arch composed of a plurality of locks, narrower at one end than at the other, so arranged that the opposing faces at the narrower ends are out of contact with each other.

950,891. GAS STOVE LIGHTER; O. H. P. Clark, Indianapolis, Ind. App. filed Nov. 27, 1908. Consists of a flexible lighting core, extending from a battery through a tube a lighter at the upper end of the tube, weight for taking up the slack in the cord, the lighter having an aluminum point to draw a spark.

950,899. PLUG FOR ELECTRICAL CONNECTIONS; A. N. Dods, Mount Vernon, N. Y. App. filed March 11, 1909. Plugs for automobile charging, for making temporary connections, having contact members protected by a shield, this shield having a suitable form serving as a guide for fitting the contact members and arranged to reduce the danger to a minimum which attend the breaking of temporary connections.

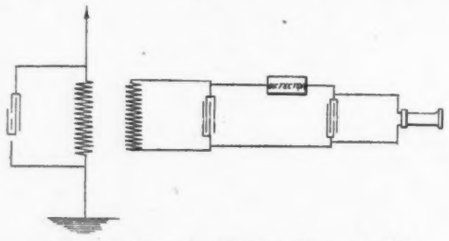
950,904. ELECTRIC FURNACE; F. A. J. Fitz Gerald, Niagara Falls, N. Y. App. filed May 13, 1909. Means for permitting the gaseous fuel to pass first through the melting chamber and then around it.

950,905. METHOD OF PROTECTING RESISTORS OF ELECTRIC FURNACES; F. A. J. Fitz Gerald, Niagara Falls, N. Y. App. filed Sept. 1, 1909. For protecting the resistance element of an electric furnace from oxidizing by introducing an inert gas into the melting chamber around the resistance.

950,911. INDUCTION FURNACE; P. Gredt, Luxemburg, Luxemburg. App. filed Aug. 31, 1906. An annular hearth; compartments for introducing the necessary additions, these being introduced under the surface of the bath in the furnace.

950,922. SECTION BREAKER; H. E. Howe, Windber, Pa. App. filed June 17, 1909. A pair of coupling members, each secured to one of the conductors, a pair of clamping plates carried by each of the coupling members, and an insulated breaker piece connecting one pair of clamping plates to the other pair.

950,932. ELECTRIC FUSE; W. J. Lehmann, Indianapolis, Ind. App. filed July 20, 1908. For inserting a fresh fuse when the first is burned out, the fusible material extending through the fuse-block



950,781.—Detector for Wireless Communication.

and a recess, and when the material is fused, the portion in the recess flows out and breaks the circuit.

950,973. APPARATUS FOR CIRCULATING THE LIQUID IN PLATING TANKS; G. L. Wallace, Bridgeport, Conn. App. filed May 15, 1909. Pumps with pipe connections at the top of the tank, and a delivery pipe extending through the bottom of the tank to pump the liquid through the tank.

951,085. SINGLE-PHASE GAS OR VAPOR ELECTRIC DEVICE; P. H. Thomas, Pittsburg, Pa. App. filed Aug. 11, 1903. Means for supplying initial potential to enable the choke coil of the apparatus in the first alternation after starting to absorb a sufficient amount of energy, so as to maintain the lamp over the first zero point without falling beneath the minimum current. Makes use of a third positive electrode as a starting electrode.

951,086. ELECTRIC FURNACE; J. Thomson, New York, N. Y., and F. A. Fitz Gerald, Niagara Falls, N. Y. App. filed May 13, 1909. A resistance element of round carbon rods which are staggered and in lineal contact with each other, the rods being loosely stacked upon each other, and contained between two terminals with bevelled faces.